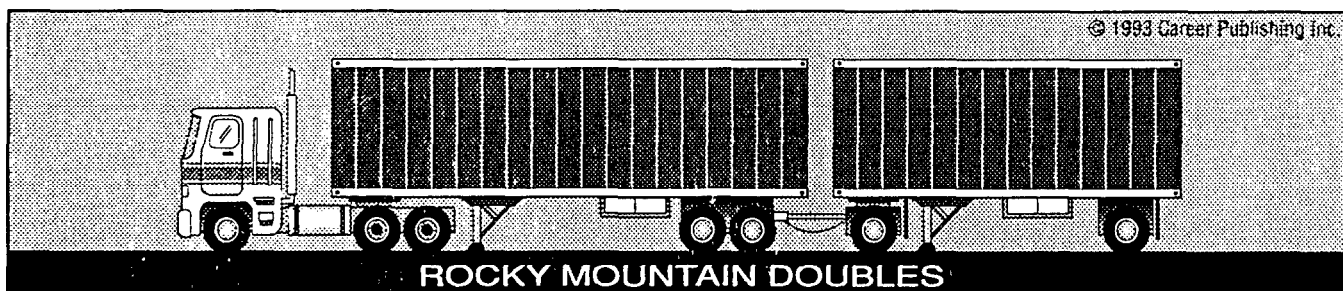
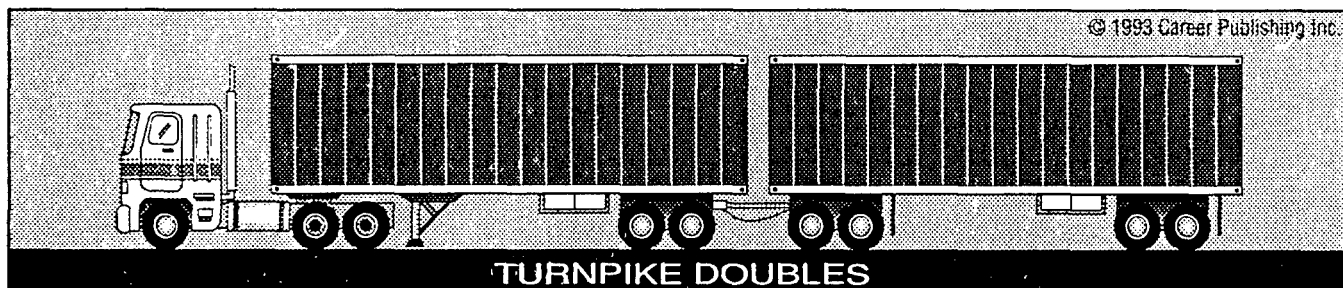
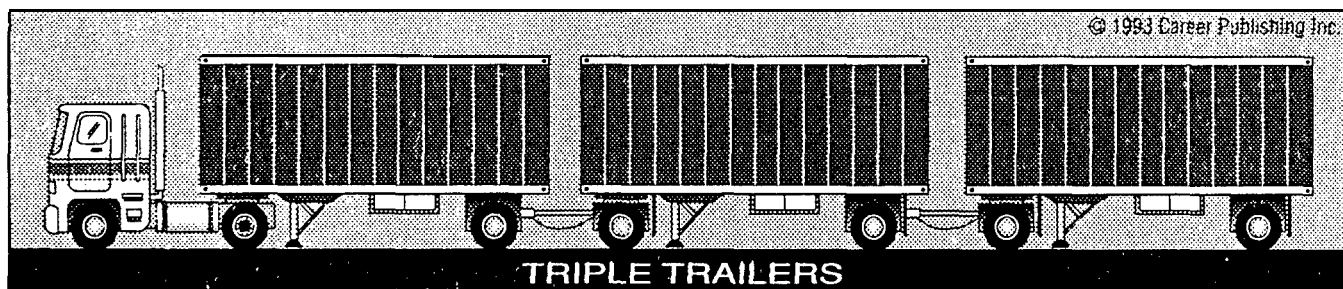
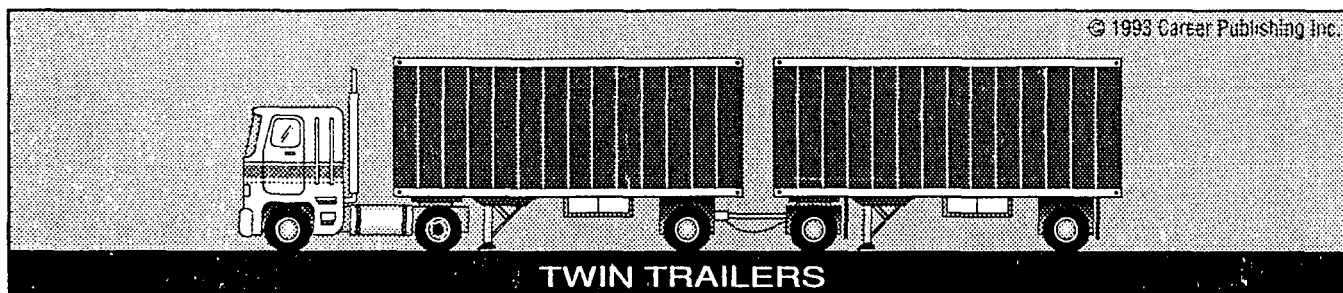


MULTIPLE TRAILER COMBINATION VEHICLE DRIVER TRAINING GUIDE

SUGGESTED UNITS OF INSTRUCTION AND CURRICULUM OUTLINE



PROFESSIONAL TRUCK DRIVER INSTITUTE OF AMERICA

8788 ELK GROVE BOULEVARD, ELK GROVE, CALIFORNIA 95624

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NOVEMBER, 1993

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Preface

This publication is made available in the interest of truck safety and the advancement of MTCV driver training. The content and procedures contained herein represent good practice against which a MTCV driver training course can be developed. The Federal Highway Administration of the U.S. Department of Transportation and its contractor, the Professional Truck Driver Institute of America, Inc. specifically disclaims any and all liability for it's content or use.

The contents do not represent an official policy of any governmental agency. They have been developed under contract DTFH61-P-00531 with the Department of Transportation, Federal Highway Administration.

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FOREWORD

This document contains a unit outline curriculum for the training of drivers new to multiple trailer combination vehicles operation. It is assumed that these “new” drivers have some experience and/or training in commercial vehicle operations and that any new training would build upon this training and/or training.

In this document the term “multiple trailer combination vehicles” or **MTCVs** refers to a vehicle comprised of a Towing unit and two or more Cargo Carrying Units connected by one or more Coupling Units:

A. Towing Unit:

1. Tractor two or three axle.
2. Dromedary tractor two or three axle.
3. Truck two or three axle.

B. Cargo Carrying Unit:

1. Short Trailer: Less than 29 feet.
2. Intermediate Trailer: 29 feet to less than 40 feet.
3. Long Trailer: Greater than 40 feet.

C. Coupling Units:

1. A- Dolly
2. B- Dolly
3. C-Dolly
4. Other

Examples:

Twins / “Western doubles”:

- Tractor and two short trailers of approximately equal lengths (26’ to 28.5’).

Triples:

- Tractor and three short trailers of approximately equal lengths (27’ to 28.5’).
- Truck and two short trailers of approximately equal lengths (27’ to 28.5’).

Lona doubles:

- Tractor and two trailers one or both of the trailers exceed 40’ in length. These combinations are commonly referred to as: “Rocky Mountain” double where the first trailer exceeds 40’, the second is 27’ to 28.5’. “Turnpike” double where both trailers exceed 40’.

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The term "curriculum" refers to a prescribed course of study and to 1) what is to be taught, and 2) what it is to be taught with. However, the unit outline curriculum prescribed here includes only "what is to be taught." It assumes that "what is to be taught with" will be documented in other materials, including the following:

- **Training Manual** -- A manual containing materials needed by driver trainees for successful instruction,
- **Instructor Manual** -- A set of lesson plans providing detailed instruction in administration of classroom, lab, range, and street lessons.
- **Test System** -- A set of written, range and street tests designed to assess attainment of the curriculum objectives.

It should be emphasized that this MTCV Driver Training Guide prescribes a course that is comprehensive in developing the basic or minimum competencies required to operate various multiple trailer combination vehicles.

Trainees successfully completing this course may still need additional road experience and specific company or job related training. How much additional learning experience is needed will obviously depend upon the individual trainee's capacity to learn; how much the basic training guide must be expanded or enhanced to meet job needs; and the quality of instruction.

All organizations are urged to carefully evaluate the specific job requirements that their student drivers are being trained for and to add all necessary materials to this training guide to enable the driver trainee to successfully meet those job requirements safely.

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Developmental Process

The training structure and its suggested content, as offered here, is the product of a developmental process which included among its sources of information, guidance, and expertise, the following:

- **Public Forum** -- Discussion at an assembly of persons representing trucking industry associations, motor carriers, insurance companies, government agencies, truck safety advocates, training institutions, experienced drivers of multiple trailer vehicles and others defined the need for, and content of, specialized training.
- **Steering Committee** -- A panel comprised of industry representatives, government officials, truck safety advocates, experts in the field of multiple trailer operations and others with strong interests in the safe and responsible operation of these vehicles provided project guidance as well as general technical support and assistance.
- **Technical Information Search** -- This activity identified the factors considered important to the safe and 'proper operation of multiple trailer combination trucks and the specialized training of the drivers who operated them. The primary purpose of this compilation was to identify the special characteristics, conditions, situations and other physiological aspects of MTCV operation that have driver training implications and that are amenable to instructional treatment. The basic sources of information included technical reports, engineering analysis, research papers, accident summaries and analysis, trucking periodicals and safety publications. A technical panel of multiple trailer combination vehicle (MTCV) specialists was engaged to review the listing and to supply additional information unavailable from published sources.
- **Technical Advisory Panel** -- A panel of highly qualified professionals, experienced in both multiple trailer combination vehicle (MTCV) operation and driver training, provided project staff with the expert review and vehicle specific expertise needed to meet project criteria. The panel reviewed and critiqued all technical content; provided specific technical assistance, pooled ideas on objectives, content and methods; served in a continuing capacity in reviewing training guide content development during each phase of the process; offered training guidance and direction; and served as representatives of the motor carrier industry active in multiple trailer combination vehicle (MTCV) operation.

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The PTDA also wishes to recognize the significance of the technical and project advisory assistance provided by the Steering Committee. The following individuals and their organizations comprised the Steering Committee:

- **Mr. Louis Albert**, United Parcel Service, South Holland, IL
- **Mr. Steve Campbell**, American Trucking Assoc., Inc., Alexandria, VA
- **Mr. Barry Cope**, Oklahoma Vo/Tech-Central, Drumright, OK
- **Mr. Howard Fitzgerald**, Watkins Motor Lines, Inc., Lakeland, FL
- **Mr. Mark Gear-in**, Yellow Freight System, Inc., Overland Park, KS
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- **Mr. Dan Smith**, National Private Truck Council, Ontario, CA
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- **Mr. Philip J. Roke**, Project Advisor,
U.S. Department of Transportation,
Federal Highway Administration,
Office of Motor Carrier Standards,
Driver Standards Division,
Washington, D.C.

Because of the significance of their efforts, special recognition is accorded to the members of the Technical Advisory Panel:

- **Mr. Leo Nellessen**, Consolidated Freightways, Salt Lake City, UT
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- **Mr. Richard Rohrer**, Global Safety Service Inc., Mechanicsburg, PA
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- **Mr. Jim Wilcox**, Yellow Freight System Inc. (retired), Albuquerque, NM

Special recognition is due also, to the following individuals who performed most of the training guide preparation and special technical tasks:

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Administrator's Guide

The Multiple Trailer Combination Vehicle Driver Training Guide's Basic Course is for driver trainees who already possess a Class A-CDL license and who have accumulated a minimum of six months of recent, verifiable commercial driving experience. Therefore, the Basic Course curriculum assumes a basic knowledge of commercial motor vehicle safe driving practices, and traditional driver training subjects. Of course, this does not preclude an organization from including these training subjects in their course of study.

The curriculum is flexible in its design, in order to accommodate the various types of MTCVs and the diverse training and driving experience of the students taking the program. This flexibility requires that different MTCVs have different minimum training and experience requirements prior to entering the program.

Purpose

Better trained MTCV truck drivers can reduce the number of accidents on our highways. With this in mind the training guide prescribes a complete instructional program for training both novice and experienced MTCV drivers. It also provides for a driver recertification program. Its purpose is to aid schools and fleets in providing and sustaining all the competencies required to operate multiple trailer combination vehicles.

Not all trainees are novices, therefore, exceptions to the hours of instruction are appropriate when:

- Attainment of instructional objectives for each unit can be demonstrated through objective measures.
- Trainees have already achieved partial fulfillment of objectives through prior training or experience.
- Trainees are being trained by or for specific employers whose operation makes attainment of certain objectives unnecessary.

Organization of Training Guide

The curriculum is divided into sections and units. Sections 1 through 5 comprise the Basic Training Guide, Sections 6 and 7 the Advanced Training Guide and Section 8 a Recertification Training Guide. An outline of the curriculum by section and unit appears on page 24. Eight sections of instruction are used with each section containing from three to ten units. Each section has different objectives.

Sections 1 through 5 form the basic curriculum and provide familiarization with a single MTCV vehicle having only two (2) cargo carrying units (customarily twins).

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MTCVs can have numerous configurations and each configuration or vehicle type has operational characteristics unique to the particular vehicle.

Sections 6 and 7 provide the vehicle familiarization and performance practice necessary to acquire minimum competencies in a different MTCV. The basic curriculum is a prerequisite to sections 6 and 7.

The retraining and requalification of drivers is an important safety principle. Section 8 provides a course of instruction of instruction capable of satisfying this requirement.

Student Requirements / Eligible Training Vehicle

The curriculum is designed to accommodate a trainee with a minimum of six months verifiable commercial driving experience and a class A-CDL license. This trainee would be eligible to take the basic curriculum (sections 1 through 5) with only a Twin MTCV (tractor and two short trailers less than 29 feet). After having acquired an additional six months of verifiable experience with twins he/she would then be eligible to complete sections 6 and 7 with a different MTCV.

A trainee with six months verifiable tractor trailer experience and a class A-CDL is eligible to complete sections 1 through 5 of the curriculum with any MTCV vehicle having two (2) cargo carrying unit, for example, Twins, Rocky Mountain or Turnpike doubles, and then complete sections 6 and 7 with another MTCV of his / her choice.

The following matrix was designed to help explain these requirements:

Prerequisite	Eligible Training Vehicle	Training Guide
Minimum six (6) months verifiable commercial driving experience. Class A-CDL.	Tractor and two (2) short Cargo Carrying Units, e.g. Twins.	Basic, sections 1 through 5
Minimum six (6) months verifiable tractor-trailer driving experience. Class A-CDL.	Tractor and any two (2) Cargo Carrying Units. Does not include triples.	Basic, sections 1 through 5
Minimum six (6) months verifiable tractor-trailer driving experience. Class A-CDL. Completion of Basic Curriculum.	Any MTCV. <u>Twins certification is a prerequisite to triples training.</u>	Advanced sections 6 and 7
Completion of Basic / Advanced Curriculum in <u>specific</u> vehicle(s).	Specific MTCV(s) licensed to drive.	Recertification section 8

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Basic Training Guide Unit Outline

UNIT Section 1- Orientation

1.1	MTCVs In Trucking
1.2	Regulatory Factors
1.3	Driver Qualifications
1.4	Vehicle Configuration Factors

Section 2 - Basic Operation

2.1	Inspection
2.2	Coupling And Uncoupling
2.3	Basic Control And Handling
2.4	Basic Maneuvers
2.5	Turning, Steering & Tracking
2.6	Proficiency Development

Section 3 - Safe Operating Practices

3.1	Interacting With Traffic
3.2	Speed & Space Management
3.3	Night Operations
3.4	Extreme Driving Conditions
3.5	Proficiency Development

Section 4 - Advanced Operations

4.1	Hazard Perception
4.2	Hazardous Situations
4.3	Maintenance & Troubleshooting

Section 5 - Non-driving Activities

5.1	Routes And Trip Planning
5.2	Cargo & Weight Considerations
5.3	Public Relations And Safety

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Advanced Training Guide Unit Outline

Section 6 - Vehicle Familiarization

6.1	Inspection
6.2	Coupling And Uncoupling
6.3	Basic Control And Handling
6.4	Basic Maneuvers
6.5	Turning, Steering & Tracking
6.6	Proficiency Development

Section 7 - Performance Practice

7.1	Interacting With Traffic
7.2	Speed & Space Management
7.3	Night Operations
7.4	Extreme Driving Conditions
7.5	Hazard Perception
7.6	Proficiency Development

Recertification Training Guide Unit Outline

Section 8 - Recertification

8.1	Introduction / Inspection
8.2	Basic Skills Evaluation
8.3	Interacting With Traffic
8.4	Speed & Space Management
8.5	Night Operations
8.6	Extreme Driving Conditions
8.7	Hazard Perception
8.8	Hazardous Situations
8.9	Public Relations And Safety
8.10	Proficiency Evaluation

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BASIC MTCV Training Guide Instructional Objectives

Section 1 - Orientation

The units in this section provide an orientation to the driver training curriculum outline and covers the role MTCVs play in the industry, the factors which affect their operations and the role the drivers play in the safe operation of MTCVs.

Section 2 - Basic Operation

The units in this section cover the interaction between trainee drivers and the vehicle. They are intended to teach driver trainees how to inspect, couple and uncouple MTCV trailers, ensure the vehicles are in the proper operating condition, and control the motion of the vehicles under various road and traffic conditions.

During the range and street exercises in this section, the student will first familiarize himself/herself with basic backing principles utilizing a single trailer. The student will then become familiar with the basic operating characteristics of a specific MTCV. Utilizing this vehicle, the students must be able to perform the skills learned in each unit to a level of proficiency required to permit safe transition to on street driving.

Section 3 - Safe Operating Practices

The units in this section cover the interaction between driver trainees, the vehicle, and the traffic environment. They are intended to teach driver trainees how to apply their basic operating skills in a way that ensures their safety and that of other road users under various road, weather and traffic conditions.

Section 4 - Advanced Operations

The units in this section introduce higher level skills that can be acquired only after the more fundamental skills and knowledge taught in sections two and three have been mastered. The purpose of this section is to teach the perceptual skills necessary to recognize potential hazards and to demonstrate the procedures needed to handle a MTCV combination vehicle when faced with a hazard.

Section 5 - Non-Driving Activities

The units in this section cover activities not directly related to the vehicle itself but which must be performed by the MTCVs driver. The objective of the units in this section is to insure that these activities are performed in a way that assures safety to the driver, the vehicle, cargo, and other road users. Unit 5.3 provides instruction on the importance of professionalism, maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

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ADVANCED MTCV Training Guide Instructional Objectives

Section 6 - Vehicle Familiarization

The units in this section provide the trainee drivers an opportunity to familiarize himself/herself with a different MTCV configuration. In this section the driver will apply the basic competencies he/she acquired in the Basic MTCV course to a different MTCV.

The driver trainees will review how to inspect, couple and uncouple a different MTCV, ensure the MTCV is in the proper operating condition, and control the motion of the MTCV under various road and traffic conditions.

During the range and street exercises in this section, the student will first familiarize himself/herself with basic backing principles utilizing a single trailer. The student will then become familiar with the basic operating characteristics of the MTCV. Utilizing this vehicle, the students must be able to perform the skills learned in each unit to a level of proficiency required to permit safe transition to on street driving.

Section 7 - Performance Practice

The units in this section provides the trainee driver an opportunity to familiarize himself/herself with a different MTCV. In this section the driver will apply the basic competencies he/she acquired in the Basic MTCV course to a different MTCV.

The units in this section cover the interaction between driver trainees, the vehicle, and the traffic environment. They are intended to teach driver trainees how to apply their basic operating skills in a way that ensures their safety and that of other road users under various road, weather and traffic conditions.

RECERTIFICATION Training Guide Instructional Objectives

Section 8 - Recertification

The units in this section provides drivers an opportunity to refresh, update and build upon their training and experience. In this section the drivers will apply the basic competencies he/she's acquired in various MTCV configurations and review how the interactions between themselves, the vehicle, and the traffic environment can ensure their safety and that of other road users under various road, weather and traffic conditions.

Emphasis is placed on the importance of safe operating practices, hazard identifications, driver professionalism, maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

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Instructional Sequence

- Basic Training Guide
 - The 21 units of instruction contained in the first five basic sections may be taught in any sequence that leads to efficient learning. The first three sections form a natural learning sequence beginning with orientation to the vehicle and the industry (Section 1), then basic control of the vehicle's motion (Section 2), then the needs of the highway traffic environment (Section 3). The units in Sections 4 and 5 are **more** independent than the first three Sections and can generally be taught in any sequence. Because they involve classroom and laboratory instruction for the most part, they may be scheduled concurrently with behind-the-wheel (BTW) instruction to make the best use of equipment, facilities and training time.
- Advanced Training Guide
 - The 12 units contained in sections 6 and 7 are to be taught at any time after completion of the Basic Training Guide. These sections form a natural learning sequence beginning with Vehicle Familiarization and concluding with Performance Practice of safe driving principles.
- Recertification Training Guide
 - The 10 units **of** Section 8 form the basis of a Recertification Training Guide. This program should be implemented on a periodic basis to sustain competencies, such as prior to re-licensing. It should also be used whenever a driver competence or safety concern arises.

Instructional Objectives

Objectives are specified for each unit of instruction. These objectives describe the performances, knowledge, skills, and attitudes that trainees must achieve before training can be considered adequate for certification.

- **Performance objectives** describe the “real world” performances that trainees are to achieve on the basis of training.
- **Knowledge objectives** describe the information that is needed to enable and/or motivate trainees to attain performance objectives.
- **Skill objectives** describe the perceptual, manipulative, and reasoning skills that must be attained through practice to achieve performance objectives.
- **Attitude objectives** describe the beliefs that trainees must hold in order to assure a high likelihood that performances will occur in actual MTCVs operation.

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Methods

The specifications identify five instructional methods:

- 0 **Classroom:** Classroom instruction occurs indoors, accomplished by instructional aids that allow large numbers of trainees to be taught effectively at one time.
- 0 **Independent study:** A portion of classroom instruction may be waived through the use of suitable independent study methods.
- 0 **Lab:** Laboratory instruction refers to any instruction occurring outside of a classroom that does not involve actual operation of the vehicle or its components. It may take place in a parking lot, garage, or any other appropriate facility conducive to instruction.
- 0 **Range:** Range instruction occurs on a protected off-street "driving range", where trainees may make use of tractor-trailers without hazards from cars or other road users. Those institutions / companies that lack access to off-street facilities may conduct range instruction on public property, provided adequate control of other traffic is available to avoid danger to trainees, instructors, or other road users.
- 0 **Street:** Street instruction refers to behind-the-wheel (BTW) instruction that occurs in roadway configurations and traffic conditions needed to satisfy the objectives of the lessons for which the instruction is required.

Printed materials

Each program must provide the printed materials needed for effective instruction, including teacher's guide and lesson plans, self-instructional text and manuals, classroom handouts, reference aids, and checklists. Design of materials must facilitate their effective use and should fulfill the following requirements:

- **Content:** Must be appropriate to intended use, e.g., self-instruction, preparation for instruction, and use during instruction. Information should be sufficiently comprehensive to achieve the announced objectives. The information should be up to date.
- **Format:** Must fit conditions of use, e.g., in a classroom, on the range in the vehicle, or independent study.
- **Organization:** The organization and presentation of instructional materials should be in accord with sound principles of learning. It should facilitate access to needed information, e.g., use of sequence, detailed indexing, and bibliographies.
- **Reading level:** The reading level of the instructional material should be keyed to the reading competence of the average trainee. Materials intended for trainee use should not exceed the sixth grade reading level.

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Visual materials

Classroom instruction must be supported by appropriate visual materials including transparencies, slides/cassette presentations, films, video tapes, roll displays, traffic boards, models, mark-ups, etc. Visuals must fulfill the following requirements:

- **Content:** Must be relevant to the objectives of the unit in which the visual was used.
- **Presentation:** Must be highly informational as opposed to entertaining. It should be sufficiently comprehensive to achieve the announced instructional objectives.
- **Dynamic media (e.g., film, videotape):** Should be used whenever motion is an essential part of the information to be communicated.
- **Interaction:** Between instructor and trainee should be fostered by use of short presentations and visuals that can be created **or** altered during instruction (e.g., transparencies, enlargements, etc.).

Equipment

Programs must provide all of the equipment needed for effective instruction. The following specifies the general equipment required throughout this curriculum. Additional equipment requirements are specified under individual unit requirements. The following standard items of training equipment are required:

- **Projectors:** To include motion picture, slide, overhead, **and/or** video tape. Visuals must be appropriate to the material being taught.
- **Range equipment:** Including traffic cones, stanchions, barriers, etc., to create maneuver restrictions in teaching basic control, equipment positioning, coupling, ducking, parking, and other basic maneuvers.
- **Maintenance equipment:** Including spare parts, tires, jumper cables, and various other tools necessary to properly maintain the equipment used in training.
- **Safety equipment:** To Include fire extinguishers, first aid kits, reflective triangles, flashlights, and any other safety equipment appropriate to the instructional procedure.

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Training vehicles

Several MTCVs are required to support the curriculum. The exact number required is dependent upon the number of trainees in the school at one time, the proportion of their time spent in the vehicle and the trainee to vehicle ratios. The vehicles used for street training must meet all applicable state and federal requirements for operation on public roadways. This includes seat belt requirements. Specific operational equipment requirements are as follows:

A. Towing Unit:

1. Tractor two or three axle.
2. Dromedary tractor two or three axle.
3. Truck two or three axle.
 - Engine: Diesel powered.
 - Transmission: At least two types of manual transmissions providing a range of from five to thirteen forward speeds.
 - Drive axles: Single axle and twin screw tandem drive axle tractor.
 - Cab type: Both conventional and cab over engine (COE).
 - Cab configuration: When trainee observation is used, space must be provided for observers, e.g., a crew cab, replacement of the sleeper berth, or a cargo box.

B. Coupling Units:

1. A-Dolly
 2. B-Dolly
 3. C-Dolly
 4. Other
- Converter dolly: The converter dollies used should have single or tandem axle (depending on application) and must be equipped with safety chains or cables to be secured to the vehicle pulling the dolly. There appears to be at least four types of dollies the most common of which is the single-drawbar "A-dolly". Therefore, the majority of the training should take place using the A-dolly. It is recommended that the trainee be provided some training on a double-drawbar, non-steering "B-dolly" also.

C. Cargo Carrying Units:

1. Short Trailer: Less than 29 feet.
2. Intermediate Trailer: 29 feet to less than 40 feet.
3. Long Trailer: Greater than 40 feet.

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- Trailers: Special trailer types are required when specialized training is provided, such as tank trailers, bulk carriers, refrigerated trailers, or double bottoms. Standard training trailers should be van or box type trailers.
 - The twin trailer configuration should be two 27 to 29 foot single axle semitrailers.
 - The triple trailer configuration can be three 27 to 29 foot single axle semitrailers, or a straight truck (27 to 29 foot cargo bed) with two 27 to 29 foot single axle semitrailers.
 - The turnpike double configuration should be two 40 to 48 foot tandem axle semitrailers.
 - The rocky mountain double configuration should be a tandem axle 40 to 48 foot semitrailer with a second 27 to 28 foot single axle semitrailer.
 - Numerous other configurations of towing units, coupling units and cargo carrying units are possible.
 - During at least 50 percent of the street training, the **MTCVs** trailers should each be loaded with non-hazardous cargo, a minimum of 7,000 lbs. on the short trailer(s) and 10,000 lbs. on the lung trailer(s). An appropriate amount of the remaining street training time should occur with one trailer (rear) empty, two rear trailers empty (triples) and all trailers empty, to emphasize safety factors.
 - Occupant restraint systems: As required by state laws, federal regulations, company policies, and the rules of common safety practice.

Program operators may use special training devices to improve the effectiveness or economy of instruction. Hazard perception simulators, driving simulators, cutaways, and models may be used in meeting minimum instructional requirements to the extent that they are appropriate to the unit curriculum criteria and capable of satisfying the instructional objectives of the unit.

Facilities

Facilities required in support of the classroom, lab, range and street instruction must meet the currently acceptable minimum state standards for space per trainee, lighting, ventilation and other standards as required by the State Offices of Fire, Health, and OSHA.

- **Classroom facilities:** They must provide space, furniture, lighting, heating, and ventilation needed for a good learning environment.
- **Lab facilities:** Similar to the classroom facilities, they must provide space, furnishings, lighting, heating, and ventilation appropriate to the environment and capable of providing a good learning environment.

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- **Range facilities:** They must be obstruction free and sufficiently surfaced to permit maneuvers to be performed, by a novice driver, without loss of vehicle control. The dimensions must be large enough to permit the number of vehicles involved in instruction to carry out the maneuvers needed for obtainment of instructional objectives without causing interference or danger to other vehicles on the range. Access to the range area must be limited in order to avoid creating a hazard to or from the general public.
- **Street routes:** They must represent the broadest range of legally accessible traffic situations with respect to the following:
 - Number of lanes -- two lanes, multi-lanes
 - Setting -- urban, suburban, rural
 - Configuration-- straight, curved, ramps, merges, etc.
 - Grade -- steep, gradual, uphill, downhill
 - Structures -- bridges, tunnels, road crossings, railroad crossings
 - Road density -- light tunnels, road crossings
 - Access -- unlimited, limited, or freeway

Suggested Hours of Instruction

An outline of the curriculum by section, unit, and instructional method appears on the following page. The numbers indicate the minimum hours required for each unit, and each instructional method within that unit. Range and street hours refer to BTW instruction.

Exceptions to these minimum hours are acceptable where:

- Attainment of instructional objectives for each unit can be demonstrated through objective measures.
- Trainees have already achieved partial fulfillment of objectives through prior training or experience.
- Trainees are being trained by or for specific employers whose operation makes attainment of certain objectives unnecessary.

As shown in the outline, a minimum of 114 hours of direct driver trainee participation is deemed necessary for a driver, inexperienced in MTCVs, to attain the curriculum's instructional objectives of Basic MTCV. The standards require that each inexperienced trainee must receive at least 61 hours of driving time during BTW instruction.

All training hours are measured as clock hours (60 minutes) rather than class period hours (e.g. 45 or 50 minutes, etc.). In order to fulfill the requirements within the minimum hours indicated, all in-vehicle BTW time must be measured by the clock hours of actual driving time accumulated by the driver trainee. Observation time is *not* counted as BTW driving time.

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Suggested Clock Hours of Instruction: BASIC MTCV

UNIT	Section I- Orientation	CLASS- ROOM	LAB	RANGE	STREET	TOTAL
1.1	MTCVs In Trucking	1.5				1.5
1.2	Regulatory Factors	1.5				1.5
1.3	Driver Qualifications	1				1
1.4	Vehicle Configuration Factors	3				3
TOTAL		7	0	0	0	7

Section 2 - Basic Operation

2.1	Inspection	2	4			6
2.2	Coupling And Uncoupling	2		3		5
2.3	Basic Control And Handling	0.75		2		2.75
2.4	Basic Maneuvers	0.75		6		6.75
2.5	Turning, Steering & Tracking	1		2		3
2.6	Proficiency Development	0.5		5	8	13.5
TOTAL		7	4	18	8	37

Section 3 - Safe Operating Practices

3.1	Interacting With Traffic	2			2	4
3.2	Speed & Space Management	2			4	6
3.3	Night Operations	1.25	1	1	2	5.25
3.4	Extreme Driving Conditions	2	2			4
3.5	Proficiency Development	0.75			24	24.75
TOTAL		8	3	1	32	44

Section 4 - Advanced Operations

4.1	Hazard Perception	4			2	6
4.2	Hazardous Situations	3				3
4.3	Maintenance & Troubleshooting	2	2			4
TOTAL		9	2	0	2	13

Section 5 - Non-driving Activities

5.1	Routes And Trip Planning	3				3
5.2	Cargo & Weight Considerations	4.5	2			6.5
5.3	Public Relations And Safety	3.5				3.5
TOTAL		11	2	0	0	13

SECTIONS I THROUGH 5 TOTALS 42 11 19 42 114

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Suggested Clock Hours of Instruction: ADVANCED MTCV

UNIT	Section 6 Vehicle Familiarization	CLASS- ROOM	LAB	ON RANGE	ON STREET	TOTAL
6.1	Introduction / Inspection	0.5	1			1.5
6.2	Coupling And Uncoupling	0.5		1		1.5
6.3	Basic Control And Handling	0.5		1		1.5
6.4	Basic Maneuvers	0.5		2		2.5
6.5	Turning, Steering & Tracking	0.25		1		1.25
6.6	Proficiency Development	0.25		2	3	5.25
TOTAL		2.5	1	7	3	13.5

Section 7 - Performance Practice

7.1	Interacting With Traffic	0.75			1.5	2.25
7.2	Speed & Space Management	0.5			2	2.5
7.3	Night Operations	0.5		1	2	3.5
7.4	Extreme Driving Conditions	0.5				0.5
7.5	Hazard Perception	0.5			1	1.5
7.6	Proficiency Development	0.25			4	4.25
TOTAL		3	0	1	10.5	14.5

SECTIONS 6 AND 7 TOTALS	5.5	1	8	13.5	28
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SECTIONS 1 THROUGH 7 TOTALS	47.5	12	27	55.5	142
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Suggested Clock Hours of Instruction: Recertification

Section 8 - Recertification

8.1	Introduction / Inspection	1	0.75			1.75
8.2	Basic Skills Evaluation	0.5		1		1.5
8.3	Interacting With Traffic	0.75			1.5	2.25
8.4	Speed & Space Management	1			1.5	2.5
8.5	Night Operations	0.5		1	1	2.5
8.6	Extreme Driving Conditions	0.5				0.5
8.7	Hazard Perception	0.75			1	1.75
8.8	Hazardous Situations	0.75				0.75
8.9	Public Relations And Safety	1				1
8.10	Proficiency Evaluation	0.25		0.5	0.75	1.5
SECTION 8 TOTALS		7	0.75	2.5	5.75	16

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Units of Instruction

Overview

There are 42 instructional units in the **MTCVs** Driver Training Guide. These units are grouped into eight sections:

- Section 1 - Orientation
- Section 2 - Basic Operation
- Section 3 - Safe Operating Practices
- Section 4 - Advanced Operation
- Section 5 - Non-driving Activities
- Section 6 - Vehicle Familiarization
- Section 7 - Performance Practice
- Section 8 - Recertification

Each of the unit descriptions is organized to present this definitive information about each unit of instruction:

- **Purpose:** A short statement of unit purpose and intent. Some unit purpose statements may be reinforced with a declaration of emphasis or a statement of justification.
- **Outline of content:** A list of the suggested major subject areas covered by the unit of instruction.
- **Instructional objectives:**
 - Performance objectives
 - Knowledge objectives
 - Skill objectives
 - Attitude objectives
- **Major supporting concepts:** A summary listing of the general ideas or conceptual foundation upon which instruction is to be based, emphasized, justified, structured or focused.
- **Materials:** Descriptive or illustrative information useful to provide instructional support and definition.

Subject matter outline is as follows:

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Outline of Subject Matter: BASIC MTCV

Section 1 - Orientation

Unit 1.1 MTCVs In Trucking

1. Introduction
2. Professional driver
3. Background of MTCVs in transportation

Unit 1.2 Regulatory Factors

1. Federal government
2. State and local government
3. Specific regulatory factors affecting MTCVs

Unit 1.3 Driver Qualifications

1. Federal government
2. State and local government
3. Personal health and driving
4. Driver training and professionalism

Unit 1.4 Vehicle Configuration Factors

1. Introduction
2. Tractor cab design
3. Tractor axle configuration
4. Basic full or semi trailer types with or without pintle hook
5. Trailer axle configuration
6. Converter dully
7. Vehicle configurations
8. Articulation factors
9. Axle arrangement factors
10. Matched equipment factors
11. Trailer placement rules, regulations and policies

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Section 2 - Basic Operation

Unit 2.1 Inspection

1. Introduction to vehicle inspections
2. Pre-trip inspection procedures
3. Enroute inspection procedures
4. Post-trip inspection procedures
5. Additional procedures for reporting
6. What to look for when inspecting tractor, trailer and converter dolly
7. Vehicle walk around sequence

Unit 2.2 Coupling and Uncoupling

- 1 Introduction to hitching mechanisms
- 2 Combination vehicle air brakes
- 3 Staging of equipment
- 4 Coupling routine includes
- 5 Detailed step by step coupling procedures
6. Detailed step by step uncoupling procedures
7. Summary of safety concerns

Unit 2.3 Basic Control and Handling

1. Putting the vehicle in motion
2. Stopping the vehicle
- 3 Braking performance is a function of
stopping distance and vehicle controllability
- 4 Vehicle characteristics
- 5 Handling and stability characteristics
- 6 Summary of safety concerns

Unit 2.4 Basic Maneuvers

1. Backing
2. Parking MTCVs
3. Lane positioning and path selection
4. Merging
5. Summary of safety concerns

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Unit 2.5 Turning, Steering and Tracking

1. Turning the vehicle
2. positioning to turns
3. Steering
4. Trailer fidelity (tracking)
5. Off-tracking
6. Summary of safety concerns

Unit 2.6 Proficiency Development: Basic Operations

1. Introduction to proficiency development exercises
Classroom
2. Proficiency development: Vehicle control
Range
3. Proficiency development: Vehicle maneuvers
Pre-street
4. Skill attainment evaluation
5. Practice basic skills and maneuvers
On-street
6. Skill attainment evaluation

Section 3 - Safe Operating Practices

Unit 3.1 Interacting With Traffic

1. Introduction to sharing the road with other traffic
2. Visual search techniques
3. Communications

Unit 3.2 Speed and Space Management

1. Speed management
2. Space management

Unit 3.3 Night Operations

1. Night driving factors
2. Night driving procedures

Unit 3.4 Extreme Driving Conditions

1. Cold weather operations
2. Hot weather, desert conditions
3. Mountain driving

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Unit 3.5 Proficiency Development: Safe Operating Practices

1. Introduction to on-street proficiency development (Classroom)
2. Proficiency development: Safe Operating Practices

Section 4 - Advanced Operations

Unit 4.1 Hazard Perception

1. Importance of hazard recognition
2. Road characteristics
3. Road user characteristics
4. Road user activities
5. Characteristics of MTCVs
6. Commentary driving techniques

Unit 4.2 Hazardous Situations

1. Hazardous situations
2. Emergency maneuvers
3. Skid dynamics
4. Types of skids MTCVs can experience
5. Skid recovery
6. Rollover
7. Unsafe driving acts

Unit 4.3 Maintenance and Troubleshooting

1. Nature and importance of preventive maintenance
2. Performing basic servicing and routine maintenance
3. Diagnosing and reporting vehicle trouble

Section 5 - Non-Driving Activities

Unit 5.1 Routes and Trip Planning

1. Trip planning principles
2. Route planning principles
3. Hazardous materials
4. Record keeping and trip records
5. Communications

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Unit 5.2 Cargo and Weight Considerations

1. Cargo documentation
2. Loading, securing and unloading
3. Weight distribution and center of gravity
4. Load sequencing and trailer placement

Unit 5.3 Public Relations and Safety

1. The image of the trucking industry
2. Contact with the public
3. Customer relations
4. Employer relations
5. Safety concerns

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Outline of Subject Matter: ADVANCED MTCV

Section 6 - Vehicle Familiarization

Unit 6.1 Orientation / Inspection

1. Introduction
2. Professional driver
3. Review of vehicle pre-trip, enroute and post-trip inspection procedures
4. Additional reporting procedures
5. What to look for when inspecting tractor, trailer and converter dolly
6. Vehicle walk around sequence

Unit 6.2 Coupling and Uncoupling

1. Staging of equipment
2. Review coupling routine
3. Summary of safety concerns

Unit 6.3 Basic Control and Handling

1. Braking performance is a function of stopping distance and vehicle controllability
2. Vehicle characteristics
3. Handling and stability characteristics
4. Summary of safety concerns

Unit 6.4 Basic Maneuvers

1. Backing
2. Parking MTCVs
3. Lane positioning and path selection
4. Merging
5. Summary of safety concerns

Unit 6.5 Turning, Steering and Tracking

1. Vehicle configuration considerations
2. Vehicle handling characteristics
3. Trailer fidelity (tracking)
4. Off-tracking
5. Summary of safety concerns

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Unit 6.6 Proficiency Development: Vehicle Familiarization

1. Introduction to proficiency development exercises
Classroom
2. Proficiency development: Vehicle control
Range
3. Proficiency development: Vehicle maneuvers
Pre-street
4. Skill attainment evaluation
5. Practice basic skills and maneuvers
On-street
6. Skill attainment evaluation

Section 7- Performance Practice

Unit 7.1 Interacting With Traffic

1. Introduction to sharing the road with other traffic
2. Visual search techniques
3. Communications

Unit 7.2 Speed and Space Management

1. Speed management
2. Space management

Unit 7.3 Night Operations

1. Night driving factors
2. Night driving procedures

Unit 7.4 Extreme Driving Conditions

1. Cold weather operations
2. Hot weather, desert conditions
3. Mountain driving

Unit 7.5 Hazard Perception

1. Importance of hazard recognition
2. Road characteristics
3. Road user characteristics
4. Road user activities
5. Characteristics of MTCVs
6. Commentary driving techniques

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Unit 7.6 Proficiency Development: Performance Practice

1. Introduction to on-street proficiency development (Classroom)
2. Proficiency development on street
3. Skill attainment evaluation

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Outline of Subject Matter: RECERTIFICATION

Section 8- Recertification

Unit 8.1 Introduction / Inspection

1. Introduction
2. Professional driver
3. Review of vehicle pre-trip, enroute and post-trip inspection procedures
4. Additional reporting procedures
5. What to look for when inspecting tractor, trailer and converter dolly
6. Vehicle walk around sequence
7. Summary of safety concerns

Unit 8.2 Basic Skills Evaluation

1. Introduction to exercises (Classroom)
2. Basic skills exercises (range)
3. Skill attainment evaluation.

Unit 8.3 Interacting With Traffic

1. Introduction to sharing the road with other traffic
2. Visual search techniques
3. Communications

Unit 8.4 Speed and Space Management

1. Speed management
2. Space management

Unit 8.5 Night Operations

1. Night driving factors
2. Night driving procedures

Unit 8.6 Extreme Driving Conditions

1. Cold weather operations
2. Hot weather, desert conditions
3. Mountain driving

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Unit 8.7 Hazard Perception

1. Importance of hazard recognition
2. Road characteristics
3. Road user characteristics
4. Road user activities
5. Characteristics of MTCVs
6. Commentary driving techniques

Unit 8.8 Hazardous Situations

1. Hazardous situations
2. Emergency maneuvers
3. Skid dynamics
4. Types of skids MTCVs can experience
5. Skid recovery
6. Rollover
7. Unsafe driving acts

Unit 8.9 Public Relations and Safety

1. The image of the trucking industry
2. Contact with the public
3. Customer relations
4. Employer relations
5. Safety concerns

Unit 8.10 Proficiency Evaluation

1. Introduction to on-street proficiency evaluation (Classroom)
2. Proficiency evaluation: On-range
3. Proficiency evaluation: On-street
4. Skill attainment evaluation.

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BASIC MTCV

UNIT	Section 1- Orientation	CLASS-ROOM	LAB	RANGE	STREET	TOTAL
1.1	MTCVs In Trucking	1.5				1.5
1.2	Regulatory Factors	1.5				1.5
1.3	Driver Qualifications	1				1
1.4	Vehicle Configuration Factors	3				3

TOTAL 7 0 0 0 7

Section 2 - Basic Operation

2.1	Inspection	2	4			6
2.2	Coupling And Uncoupling	2		3		5
2.3	Basic Control And Handling	0.75		2		2.75
2.4	Basic Maneuvers	0.75		6		6.75
2.5	Turning, Steering & Tracking	1		2		3
2.6	Proficiency Development	0.5		5	8	13.5

TOTAL 7 4 18 8 37

Section 3 - Safe Operating Practices

3.1	Interacting With Traffic	2			2	4
3.2	Speed & Space Management	2			4	6
3.3	Night Operations	1.25	1	1	2	5.25
3.4	Extreme Driving Conditions	2	2			4
3.5	Proficiency Development	0.75			24	24.75

TOTAL 8 3 1 32 44

Section 4 - Advanced Operations

4.1	Hazard Perception	4			2	6
4.2	Hazardous Situations	3				3
4.3	Maintenance & Troubleshooting	2	2			4

TOTAL 9 2 0 2 13

Section 5 - Non-driving Activities

5.1	Routes And Trip Planning	3				3
5.2	Cargo & Weight Considerations	4.5	2			6.5
5.3	Public Relations And Safety	3.5				3.5

TOTAL 11 2 0 0 13

SECTIONS 1 THROUGH 5 TOTALS 42 11 19 42 114

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SECTION 1 - Orientation

The units in this section provide an orientation to the training curriculum and covers the role MTCVs play in the industry, the factors which affect their operations and the role the drivers play in the safe operation of MTCVs.

Four units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS- ROOM	LAB	RANGE	STREET	TOTAL
1.1	MTCVs In Trucking	1.5				1.5
1.2	Regulatory Factors	1.5				1.5
1.3	Driver Qualifications	1				1
1.4	Vehicle Configuration Factors	3				3
TOTAL		7	0	0	0	7

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1.1 MTCVs In Trucking

Purpose

This unit provides an introduction to the emergence of MTCVs in trucking and serves as an orientation to the course content. Emphasis is placed on the role the driver plays in transportation.

Outline of Suggested Content

➤ Introduction

- A. Rules of conduct and safety.
- B. Course schedule and instructional unit outline.
- C. Course objectives and methods of evaluation.
- D. Requirements for completion of course.

➤ Professional driver

- A. Follow the law.
- B. Maintain a professional appearance,
- C. Maintaining a positive attitude,
- D. Conduct on and off duty.
- E. Following company rules and regulations.
- F. Federal Motor Carrier Safety Requirements.
- G. Basic job requirements.

➤ Background of MTCVs in transportation

- A. Historical perspective on MTCVs
- B. Importance of MTCVs to transportation.
- C. Impact on the industry.
- D. Safety record of MTCVs.
- E. Public's perspective of MTCVs.
- F. Federal, state and local government perspective.
- G. Trucking company and drivers perspective.

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INSTRUCTIONAL OBJECTIVES

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 Course objectives and expectations.
- Rules of conduct and safety while in training.
- Methods of evaluating performance and standards to be met.
- Minimum requirements for completion of course.
- 0 Company rules and regulations.
- Basic job and FMCSR requirements.
- General operation of **MTCVs** in trucking.
- 0 The impact the driver has on the image of his / her company and the trucking industry.

ATTITUDE OBJECTIVES

The driver must believe:

- That obeying traffic laws will not only reduce the risks of having an accident but will enhance the image of the professional driver.
- 0 That company rules and government regulations are important and should be followed.
- That it is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- That a professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.

Maior supporting concepts

- 0 Motor carriers and drivers ultimately must be the ones who decide that professional driving behavior is the only acceptable way to operate heavy trucks. This can be accomplished, on the part of motor carriers, by continuous efforts to qualify, hire, and train only the best, most professional people to operate their trucks. This must be coupled with consistent driver supervision and reasonable trip scheduling. For drivers, it involves adherence to the principles of professionalism, good judgment, common sense and courtesy.
- 0 Professionalism is expressed as an attitude that marks the difference between the true professional driver and a would be pretender.

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- Professionalism is the practice of safe, courteous and responsible behavior, at all times, on and off the highway.
- Every driver, professional or not, is an ambassador carrying a message to the public about truck safety and driving professionalism.
- Ultimately, the attitude and behavior of driving professionals will determine the public's perception of truck safety and truck drivers.
- Public awareness of truck safety and media attention to the topic are intense. Many people perceive current truck safety problems as the consequence of trends toward more and larger trucks.
- In the 1950's, turnpike highways in the Eastern US began to allow greater vehicle lengths and weights. The Eastern Lumber Combination Vehicle (ELCV) consisted almost exclusively of turnpike doubles, generally double 40 foot trailers and double 45 foot trailers
- In the East, the development of LCVs grew out of an availability of turnpikes. LCV development in the West, however, was motivated by great distances between urban areas. The effect on transportation has been very positive.
- In the West, truck transportation has of necessity become the critical transportation mode. The only way to offset the handicap imposed by great distances was to allow trucks to be more productive.
- MTCVs maximize this country's assets on the road. Adding a trailer to a conventional combination increases truck productivity significantly
- The A-train meets the primary need of a large-volume vehicle that can be maneuvered relatively easily at low speed.
- Carriers utilize LCV configurations with all types of trailers in response to specialized transportation needs and states' different length and weight restrictions.
- For the most part, doubles are used for long haul operations between terminals. They are operated primarily by common carriers for shipping packages and small loads. Generally, their cargo is a light density commodity and they usually weigh less than the maximum allowable weight. Doubles are not used by other carriers for the following reasons: doubles are not practical for local pickup and delivery because they are difficult to back up and the first trailer is inaccessible for loading and unloading while the trailers are coupled together; and most carriers can reach the maximum allowable truck weight with a tractor-semitrailer and do not need the extra capacity of a double. The only incentive for using doubles is their extra cubic capacity. Therefore, the use of doubles has been somewhat limited in those states where they have been allowed. Driving MTCVs is complicated by the fact that a long "train" of components must be controlled. The train consists of a tractor, a semitrailer, a converter dolly, and another trailer -- connected together and controlled at three points of articulation.

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- 0 The major motivation for the use of multiple-articulated "combinations" by commercial trucking interests is to obtain a vehicle with high cargo volume which retains the practical limits of vehicle height and width laws, **more** cargo volume is attained by lengthening the vehicle. Generally, as vehicle length increases, **so** do maneuvering problems, since the magnitude of low-speed off-tracking -- the "corner cutting" by a trailer following a track inside that of the tractor pulling it -- is directly related to length. However, the off-tracking by a vehicle of a given overall length can generally be reduced by means of additional yaw articulation points -- i.e., hitches which break up the length of the train and provide multiple articulation points which permit the trailing units to **more** closely follow the path of the towing vehicle (usually a truck tractor). By virtue of these facts, the so-called "A train" has become a popular commercial vehicle.
- 0 The use of longer combination vehicles provides the American public a safe and valuable service through the economical transport of freight. Carriers benefit because they achieve better asset utilization: one driver and power unit pulling a Rocky Mountain or Turnpike double can haul nearly as much as two single trailer combination rigs: producing a 100% gain in productivity.
- 0 The public at large benefits from **LCVs** because they protect the public investment in highways with lower axle loadings that reduce pavement wear, their safety record is superior to that of standard trucks, and they alleviate traffic congestion (and fewer vehicles means less air pollution).
- 0 A chief **concern** of the trucking industry is a shortage of well-trained and experienced drivers, which is projected to worsen. An overall shortage of drivers and an increased number of **LCVs** could result in carriers using less-experienced drivers.

MATERIALS

Classroom instruction must be supported by material describing **course** requirements, instructional objectives, schedules, rules and regulations. Instructional material, transparencies, wall charts, or individual class handouts necessary to complete the **course** should also be included.

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1.2 Regulatory Factors

Purpose

This unit provides instruction on the federal, state and local governmental bodies who propose, enact, and implement the laws, rules, and regulations which affect the trucking industry. Emphasis is placed on those regulatory factors which affect MTCVs.

Outline of Suggested Content

➤ Federal government

- A. Interstate Commerce Commission (ICC)
 - 1. Oversees freight rates.
 - 2. Issues operating permits.
 - 3. Regulates non-exempt, for-hire interstate carriers.
- B. U.S. Department of Transportation (USDOT)
 - 1. Federal Highway Administration (FHWA).
 - a. Federal Motor Carrier Safety Regulations (FMCSR).
 - b. Hazardous Materials Regulations (HMR).
 - 2. Office of Motor Carrier Safety (OMCS).
- C. Department of Defense
 - 1. Military Traffic Management Service.
- D. Environmental Protection Agency (EPA)
 - 1. Hazardous Materials Regulations.
- E. Nuclear Regulatory Commission (NRC)
 - 1. Hazardous Materials Regulations.
- F. Occupational Safety and Health Administration
 - 1. Hazardous Materials Regulations.
- G. National Transportation Safety Board (NTSB)
 - 1. Investigates transportation accidents and recommends corrective measures.
- H. Office of Technology Assessment.
 - 1. Provides the Congress with studies.

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2. Recommends legislation, further studies, corrective measures.

➤ **State and local governments**

- A. States regulate motor carriers.
- B. States set vehicle laws.
 1. Length, width and weight limits.
 2. Issue licenses to drivers.
- C. Usually a state public utility regulates intrastate trucking.
 1. Collects road, fuel and use taxes.
 2. Issue operating permits.
 3. Usually responsible for port of entries and "scale houses".
- D. Local governments may set vehicle laws.
 1. Length, width and weight limits on specific roads.

➤ **Specific regulatory factors affecting MTCVs**

- A. Surface Transportation Assistance Act (STAA) of 1982
 1. Congress requires states to allow:
 - a. Vehicles up to 102 inches wide on interstate & other principle roads.
 - b. Single axle weight of 20,000 pounds.
 - c. Tandem axle weight of 34,000 pounds.
 - d. Gross vehicle weight of 80,000 pounds.
- B. Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991
 1. The Act limits the operation of Lung doubles to the states that permitted their operation as of June 1, 1991
 2. The act defines the National Truck Network (NTN).
 3. The Act permits **LCV's** to operate on the National Truck Net work (NTN) if they comply with the Act of 1991.
 4. The Act permits states to further restrict the use of lung doubles within their borders to include:
 - a. Types of **LCV's** allowed.
 - b. Routes on which they can operate.
 - c. The length and weight of lung doubles.
 - d. Other state restrictions in force as of June 1, 1992.

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C. States and turnpike (toll road) authorities.

1. Special rules and regulations governing MTCVs.
2. Special requirements for vehicle, driver, and company.
3. Special regulations related to permits.
4. Special regulations related to designated roads and routes.
5. Special regulations related to weather conditions and equipment application.

INSTRUCTIONAL OBJECTIVES

KNOWLEDGE OBJECTIVES

Driver must know:

- Regulatory bodies and the rules they play.
- federal Motor Carrier Safety Regulations (FMCSR).
- Hazardous Materials Regulations exist.
- Basic job and FMCSR requirements.
- General operation of MTCVs in trucking.
- Specific regulatory factors affecting MTCVs.

ATTITUDE OBJECTIVES

The driver must believe that:

- Company rules and government regulations are important and should be followed.
- federal and state efforts to ensure the safety of all drivers who share the public roads are critical to the common good of everyone.
- State and local restrictions on size and weight are important safety issues.
- Hazardous material regulations protect the common good.

Major supporting concepts

- States and turnpike (toll road) authorities have special rules and regulations for operating tandem trucks and other long combination vehicles. Most of these requirements are aimed specifically at longer combination vehicles (doubles and triples up to 110 feet long). These rules and regulations include requirements for special reports, special permits, safety programs, designated highways, restricted materials, traction, tires, fifth wheels, pickup plates, kingpins, pintle hooks, draw bars, axles, brakes, splash and spray suppressants, minimum speed, load sequence, following distance, weight, length, weather restrictions, inspections, staging areas, minimum age, experience / training, insurance, and accident reporting.

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- Regulations can influence not only the size and configuration of vehicles operated but also the qualifications of drivers, the practices of carriers regarding vehicle maintenance and driver supervision, the characteristics of roads used by trucks (MTCVs), traffic rules for trucks, truck design and manufacturing.
- In December 1991, the President signed the Intermodal Surface Transportation Efficiency Act of 1991, preventing the expansion of LCV use. The act limits the operation of LCVs to the states that permitted it as of June 1, 1991. The act permits states to further restrict LCV use within their borders, but otherwise it maintains existing state restrictions. These include restrictions on the types of LCVs allowed, the routes on which they can operate, their length, and their weight and other state restrictions in effect as of that date.
- LCVs are defined in Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 as:
 - Any combination of a truck tractor and two or more trailers or semitrailers which operates on the Interstate System at a gross vehicle weight greater than 80,000 pounds.
 - Despite the reference to the Interstate System, ISTEA Section 4006 makes it clear that LCVs are also allowed to run on the National Truck Network (NTN) if they comply with the Act of 1991.
 - The National Truck Network consists of the National System of Interstate and Defense Highways and qualifying federal-aid primary system highways, as designated by the Secretary of Transportation.
 - The ISTEA of 1991 restricts the operation of longer combination vehicles and commercial motor vehicle combinations with two or more cargo-carrying units on the National Truck Network to the types of vehicles in use on or before June 1, 1991, subject to whatever State rules, regulations, or restrictions that were in effect on that date.
 - ISTEA Section 4006 prohibits States from allowing the operation (by statute, regulation, permit, or other means) of commercial motor vehicles with cargo-carrying unit lengths that exceed the length, by specific configuration, allowed and in actual lawful operation on a regular or specific basis, including continuing seasonal operation, on the National Truck Network in that State on or before June 1, 1991.
 - The National Truck Network (NTN) is defined in 23 CFR 658.5(f). The NTN includes the Interstate System, with minor exceptions, and selected non-Interstate routes. The non-Interstate NTN highways are listed in appendix A to part 658.
 - Section 4006 defines the length of cargo-carrying units as the distance from the front of the first cargo unit to the rear of the last cargo unit.
- The extent of LCV use varies in the states that allow the vehicles. Some of the turnpike states, so called because they allow LCVs only on designated

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turnpikes, have allowed LCV use for about 30 years; other Western states have allowed use for fewer than 10 years.

- 0 To ensure safer operation, states have instituted different restrictions, including those on the types of LCVs allowed, the routes on which they can operate, their length, and their weight.
- It is important to remember that LCV permits and rules are in addition to those already in force for heavy trucks in general. They give the state an added measure of control over routings, driver requirements, and equipment that they do not enjoy with standard combination vehicles.
- 0 Over the years experience with LCVs has led states to adopt strict permit rules and regulations for their operation, including limited highway use, rigorous equipment maintenance and extensive driver training and experience. Uniformity of state permit rules and regulations for LCVs is essential to ensure proper compliance by motor carriers.
- LCVs vehicle operating permits can be revoked, Individual companies must apply for LCVs permits and they are granted only to qualifying companies. Qualification can be revoked if the guidelines of the LCVs permit are violated.
- 0 All LCVs tractors must carry a LCVs permit in the cab. The permit can be a copy of the original.
- 0 In practice, the regulation of LCVs tends to be more restrictive than that of tractor-semitrailers and twins.
- **The operations outlined below are authorized by rules and regulations of the state and are subject to change with little or no notice. The notations do not describe twin 28' combinations on the Interstate, but rather longer vehicles (doubles and triples) not prescribed in the Surface Transportation Assistance Act. All US turnpikes allow twin 28'6" combinations. Detailed information concerning the required permits and fees may be obtained from individual state agencies.**
- 1. **Alaska** -- Longer doubles allowed year-round on National Truck Network and permit routes, restricted to axle weights under Formula B. Triple trailer combinations allowed on specified routes during the summer months on a permit basis. Longer doubles having maximum 48' trailer and/or combined trailer length not to exceed 95' are allowed on the National Network year-round. Triples have a maximum 28'6" trailer, 120' overall length, weight governed by bridge formula. Certain other power unit and river certification requirements apply.
- 2. **Arizona** -- Longer doubles combinations and triple trailer combinations are allowed only I-15, and are subject to 129,000 lbs. GVW and 105' in length. Longer doubles also allowed on certain routes entering Arizona from border states that allow longer doubles (limited access in Arizona); triples - certain

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routes entering Arizona from border states, 92' overall length, 121,000 lbs. on 9 axles, 123,500 lbs. on 10 axles.

3. **Colorado** -- The state allows the operation of twin 48' turnpike doubles, 48'-28' Rocky Mountain doubles, and 28' triple trailer combinations on Interstates 25, 70, 270, 76, and 225. Longer vehicle combination (LCV) permit is obtained from Department of Highways Denver with a tractor-specific annual fee. Terminal must be within 10 miles of Interstate. Weights are limited to 110,000 lbs. GVW and lengths to 95' for Rocky Mountain, and 105' for turnpike doubles and triples.
4. **Florida** -- The Florida Turnpike Authority allows twin 45' trailers to operate on the turnpike, subject to 110' length and 138,271 lbs. GVW limitations.
5. **Idaho** -- Doubles combinations limited to 48' trailer length, 105' overall length, and 105,500 lbs. GVW under annual permit. Triple trailer combinations limited to 105' overall length and 105,500 lbs. GVW.
6. **Indiana** -- The Indiana Toll Road Commission will authorize the movement of twin 48'6" trailer combinations not exceeding 127,400 lbs. GVW on the toll road. Contact the commission in Granger for permit information. Triple trailer combinations are allowed on the Toll Road only subject 28' trailer length, no overall length limit, and 127,400 lbs. GVW.
7. **Kansas** -- The Kansas Turnpike Authority allows turnpike doubles and triple trailer combinations subject to 119' overall length limit and 120,000 lbs. GVW. Triples combinations subject to driver and equipment standards, and specific routing (motor freight truck terminals within 5 - mile radius around Goodland to Colorado border on I-70; motor freight truck terminals in Baxter Springs to Oklahoma border on US 69); permits issued by Kansas DOT. Kansas DOT also issues special permits for access to turnpike from a motor freight truck terminal within a 20-mile radius from the eastern toll booth and within a 10-mile radius from any other toll booth.
8. **Massachusetts** -- The Massachusetts Turnpike Authority allows twin 48' trailer combinations under an annual permit. Gross weight cannot exceed 127,400 lbs. and equipment must be certified. No triple trailer combinations are allowed.
9. **Montana** -- Rocky Mountain doubles - 81' combined trailer length (maximum 48' semitrailer), no overall length limit. Triple combinations - 105' length (using cab-over tractor), 110' (conventional), 28% trailer; operations limited to Interstates and within 2 mile radius of services or terminal (authorization required beyond 2 miles)
10. **Nebraska** -- The state will allow triple trailer combinations not exceeding 105' in overall length, as long as the trailer are empty and the carrier maintains \$1 million in insurance. Such combinations are permitted west of Highway 50, and must originate from a staging area no more than six miles from the

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Interstate. Turnpike doubles maximum 105', Rocky Mountain doubles maximum 95'. GVWs from 80,000 lbs. to 95,000 lbs. allowed with special permit up to 10 days.

11. **Nevada** -- The state will allow twin 45' trailers or combinations not exceeding 48' for the first trailer and 42' for the second trailer (heavier trailer in the lead), and triple trailer combinations subject to a 105' overall length, and 129,000 lbs. GVW.
12. **New York** -- The New York Thruway Authority allows twin 48' turnpike doubles subject to 114' overall length, 143,000 lbs. GVW, and equipment and driver certification. No triple combinations are allowed.
13. **North Dakota** -- The state allows 75' Rocky Mountain doubles, 1 10' triples, and 1 10' turnpike doubles at GVWs up to 104,400 lbs. on Interstates (with permit) and on state designated highways.
14. **Ohio** -- The Ohio Turnpike Authority will allow a tractor-semitrailer and short doubles combination no longer than 75' or turnpike doubles up to 90' without a permit. Both are subject to ~27,000 lbs. GVW. Combinations exceeding 90' must obtain an operating permit, which includes mileage-based fees. Special permission required on doubles travel.
15. **Oklahoma** -- The state will allow 29' triple trailer combinations (five mile access) under a permit. Also allows Rocky Mountain and turnpike doubles on Interstate and four-lane highways (five mile access).
16. **Oregon** -- Allows triple trailer combinations up to 105' overall under either a single trip or an annual permit, but trailers must be consistent in size to within 6', and gross weight cannot exceed 105,500 lbs. Also allows doubles combinations with a maximum trailer length of 40', combined trailer length of 68', and 105,500 lbs. GVW. Both double and triple trailer combinations allowed on designated highways only.
17. **Pennsylvania** -- The Pennsylvania Turnpike Authority will allow twin 28'6" trailers on the turnpike, subject to an overall length of 76' and 100,000 lbs. GVW. Triple trailer combinations are not allowed.
18. **South Dakota** -- Triples: 1 10' overall, 129,000 lbs. maximum GVW, allowed on Interstates plus designated state highways; turnpike doubles and Rocky Mountain doubles: 1 10' overall, 129,000 lbs. maximum GVW, allowed on Interstates plus designated state highways; triple trailers: 28% and double trailer length limited to 48' with off-tracking requirements.
19. **Utah** -- Under annual permits triple trailer combinations not exceeding 105' overall length, truck and two trailer combinations with trailers of equal length not exceeding 95' in overall length. Rocky Mountain doubles not exceeding 98' in overall length, and twin trailer combinations not exceeding 105' overall length may be operated on the Interstate and designated highways. Under

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quarterly or annual permits two unit combinations not exceeding 77' in overall length or 84,000 lbs. gross weight may be operated on all highways. Also under quarterly or annual permits three unit combinations up to 92' in overall length with gross weight determined by Formula B limits may be operated on all roads. Utah also allows 129,000 lbs. under permit, and 53' trailers under permit (40'6" limit from kingpin to center of rear tandem axle). Auto transporters with two stinger-steered trailers not exceeding 105' in overall length may obtain annual permits.

20. **Washington** -- The state will allow Rocky Mountain doubles with a combined trailer length of 68' up to 105,500 lbs. GVW, provided that if the trailer-trailer length exceeds 60', the vehicle must be operated under permit. No triple trailer combinations are allowed.
21. **Wyoming** -- Rocky Mountain doubles with the combined length of trailers not exceeding a length of 81' or legal weight statewide. (ATA 1992)

➤ Notes on LCV regulations:

- Current Federal regulations preclude the use of **LCVs** weighing more than 80,000 pounds on the Interstate System, but do not control weights off the Interstate System.
- There are also Federal regulations that apply to the safe operation of freight vehicles operating in interstate commerce, including **LCVs**.
- Where **LCVs** are allowed by States and turnpike authorities, it is almost always only under special permit.
- Most states and turnpike authorities require **LCVs** to meet certain performance (e.g., acceleration and braking) standards and many require special driver certification.

MATERIALS

Classroom instruction must be supported by instructional material, transparencies, wall charts, or individual class handouts. Copies of the Federal Motor Carrier Safety Regulations (FMCSR), local and state regulations on **MTCVs** and other industry study guides should be used as reference materials.

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STATUS OF LCV OPERATIONS

AS OF JUNE 1,199-I

STATE	ROCKY MOUNTAIN DOUBLE	TURNPIKE DOUBLE	TRIPLE TRAILER
Alaska	X	X	
Arizona	X	X	X
Colorado	X	X	X
Idaho	X	X	X
Louisiana	X	X	X
Missouri	X	X	X
Montana	X	X	X
Nebraska	X	X	X
Nevada	X	X	X
North Carolina	X	X	X
Oklahoma	X	X	X
Oregon	X		X
South Dakota	X	X	X
Utah	X	X	X
Washington	X		
Wyoming	X		
TOLL ROADS		X	
Florida	X	X	X
Indiana	X	X	X
Kansas	X	X	
Massachusetts	X	X	
New York	X	X	
Ohio	X	X	X

Source: Western Highway Institute

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1.3 Driver Qualifications

Purpose

This unit provides classroom instruction on the federal, state and local **governmen-**tal laws, rules and regulations which define **MTCVs** driver qualifications. This is to include discussion on medical examination, drug screen, certification, and basic health maintenance such as diet, exercise, and mental health. Emphasis is placed on avoidance of alcohol and drug abuse and the avoidance of fatigue.

Outline of Suggested Content

➤ **Federal government**

A. Department of Transportation (DOT), Federal Highway Administration (FHWA).

1. Federal Motor Carrier Safety Regulations (FMCSR).

- a. Physical requirements.
- b. Medical examination.
- c. Drug screen.
- d. Application requirements.
- e. Knowledge requirements.
- f. Skill requirements.
- g. Hours of service requirements.

2. Hazardous Materials Regulations (HMR).

- a. Knowledge requirements.
- b. Skill requirements.

➤ **State and local governments**

A. States regulate driver qualifications.

1. Issue classified licenses with endorsements to drivers.

B. States set driver qualification laws.

1. Age requirements.
2. Knowledge requirements.
3. Skill requirements.
4. Experience requirements.

C. State and local governments or turnpike authorities set LCV driver specific qualification regulations.

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➤ Personal health and driving

A. Basic physical requirements.

1. Mental and physical health.
2. Maintaining a good diet.
3. Exercise.

B. Fatigue and driving.

1. Causes of fatigue.
2. Effects of fatigue.
3. Dealing with fatigue.

C. Alcohol and driving.

1. Myths and facts.
2. How alcohol works.
3. How alcohol affects driving.
4. Risks of drinking and driving.
5. Sobering up.
6. Federal law and truck drivers drinking.

D. Drugs and driving.

1. Effects of major categories of drugs.
2. Rules for using medically prescribed or over-the-counter drugs.

E. Mental health

1. Stress leads to driver error.
2. Job conditions that lead to physical and mental fatigue.
3. Living habits and problems can affect job performance.

➤ Driver training and professionalism

A. Knowledge deficiencies, myths vs. facts.

B. Skill acquisition requires minimum knowledge.

C. Performance is enhanced through knowledge and skill acquisition.

D. Training enhances on the job experience.

E. Professionalism is a product of knowledge, skill and attitude.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Meet USDOT, FHWA qualification and certification standards for driving MTCVs.
- Meet state and local licensing and qualification standards for driving MTCVs.
- Meet carrier qualification and certification standards for driving MTCVs.
- Not use or possess alcohol and/or drugs that would affect his / her driving function, before or while operating MTCVs.
- Use proper diet, exercise, and rest to remain alert while driving.
- Minimize fatigue through proper rest while on or off duty.

KNOWLEDGE OBJECTIVES

Driver must know:

- Federal Motor Carrier Safety Regulations (FMCSR) for qualification and certification to drive MTCVs.
- State regulations for qualification and certification to drive MTCVs.
- Carrier qualification and certification standards for driving MTCVs.
- The effects of alcohol, drugs, poor diet, fatigue, poor vision, hearing and general health on safety.
- The background, experience and character requirements for being a safe, successful, professional MTCVs driver.
- The importance of training and the role it plays in professional driving.

ATTITUDE OBJECTIVES

The driver must believe that:

- Company rules and government regulations are important and should be followed.
- Federal and state efforts to ensure the safety of all drivers who share the public roads are critical to the common good of everyone.
- Safe operation of a motor vehicle demands that the operator be physically and mentally fit.
- Physical and mental fitness requires proper rest and diet, good health, and avoidance of alcohol and other drugs.

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Major supporting concepts

- 0 The ISTEA (1991) legislation directs the US DOT to establish minimum training standards for drivers of LCVs. The Act of 1991 also requires that the certification of these drivers' skills and abilities be accomplished by instructors who meet certain minimum requirements to assure a certain degree of quality control and uniformity. The FHWA is responsible for prescribing the minimum Federal regulations commercial motor vehicles, including LCVs.
- 0 In a review of State regulations for LCV operation it was found that several States specify or require special training for "triple trailer" operation but there are not similar requirements for the operation of Rocky Mountain or Turnpike doubles
- 0 States and turnpike (toll road) authorities have special rules and regulations for operating tandem trucks and other long combination vehicles. Some of these requirements apply to LCVs. These rules and regulations include requirements for minimum age, experience and training.
- Regulations can influence not only the size and configuration of vehicles operated but also the qualifications of drivers.
- Perhaps the most important element of LCV regulation is that of driver qualification. In the past, many states have accepted the training and certification programs of individual carriers, knowing that the permit privilege was a strong enough incentive to insure that only the best drivers would be "moved up" to LCVs. Now, however, the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) and consequent federal rulemaking have stimulated both industry and government to begin working on guidelines for certifying drivers of LCVs: Federal Highway Administration, Professional Truck Drivers Institute; WASHTO Highway Transport Committee Task Force, and Western Highway Institute. The use of such standards will insure that there will be no slippage in the qualifications expected of LCV drivers.
- Some states require that multiple trailer combination vehicles be operated only by drivers who have been fully trained, are well skilled, and have experience operating commercial vehicles.
- 0 Several states have a minimum age requirement (usually 25 or 30) for drivers of LCVs. Some require that LCV drivers have extensive experience driving tractor-semitrailers and that they show 3 to 5 years of safe driving prior to being granted a license.
- 0 Some states require operators of multiple trailer combination vehicles to have their driver's driving records reviewed to determine whether the driver meets minimum requirements for safe driving. Great weight is given to violations (such as speeding, reckless driving, and operating while under the influence of alcohol or drugs) that indicates the driver has exhibited disregard for the safety of the public.

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- One objective of any training effort is preparedness. The more driving skill that is obtained in a controlled environment, the less remains to be learned on the job. Therefore, an effective training system can be expected to minimize the reliance on experience to teach safe practice.
- Experience per se, does not automatically guarantee increased skill and progressively upgraded performance (e.g., 20 years of driving experience may mean one year of experience multiplied 20 times). There are many levels or degrees of experience. When we refer to good experience we mean *gainful* experience -- the kind where the driver gains in skill, practical knowledge or wisdom by observing, doing, or driving in situations and then applying this advantage successfully in later similar situations.
- Do not assume that a driver of a semi-trailer combination unit can easily make the switch to a multiple trailer unit with little or no special training. The controllability and maneuverability of these multiple trailer units can vary greatly.
- A 1984 California safety study observed the performance of LCVs on urban freeways. In general, none of the vehicles experienced significant problems, even in stop-and-go conditions. Much of the credit for the good performance of the LCVs on urban freeways was attributed to the driver's skills:
 - "The major observation of the test team is that the viability of LCVs on mainline urban freeways depends much more on the skill of the driver than the length or configuration of the combination tested. The driver took the approach of driving a steady line; that is, an absolute minimum number of lane changes, making the necessary lane changes far in advance, trying to maintain a constant speed, and not rushing through the urban areas. This gave the auto drivers a constant, or at least predictable, truck that they could react to when making their decisions."
- Since each vehicle has unique characteristics, drivers need specialized training for each configuration just as airline pilots need to log hours in different types of aircraft.
- Training and experience are critical factors affecting how well drivers deal with LCVs' operational characteristics, FHWA, the National Transportation Safety Board, Office of Technology Assessment (OTA), and the trucking industry have increasingly recognized the need for additional truck driver training, particularly for LCVs. Studies indicate that drivers should be trained on how to handle LCV's special operational characteristics, stay constantly alert, anticipate potential problems further in advance, and adjust their speed to conditions with greater diligence.
- Both in-depth analyses of accidents involving large trucks and driver surveys indicate that multiple-trailer trucks have operational characteristics that require the driver to have additional training and skill.
- Drivers must have adequate driver training, both on the road and in the classroom, to make them aware of the variables that influence the

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controllability and maneuverability of the multiple trailer configurations and how these variables compare to and contrast with those that affect operation of the semi-trailer combination. Drivers should not be driving MTCV combinations without this specialized training.

- It is reasonable to hypothesize that: since control problems arise primarily when the combination of vehicles (MTCVs) is required to perform a maneuver that is more severe than maneuvers experienced in everyday driving, then drivers need to have the opportunity to learn how to react properly when faced with these conditions.
- Recurrent training of drivers is important to keep experienced drivers up to date; it also helps to identify bad habits that may have developed over time and provides the opportunity to prescribe corrective training.

MATERIALS

Classroom instruction must be supported by instructional material, transparencies, wall charts, or individual class handouts which support the instructional objectives. Copies of the Federal Motor Carrier Safety Regulations (FMCSR), local and state regulations and other industry study guides should be used as reference materials

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1.4 Vehicle Configuration Factors

Purpose

This unit provides classroom instruction on the key vehicle components used in the configuration of combination vehicles. The unit serves to provide familiarization with various vehicle configurations or combinations. It also provides instruction on the specific factors or rationale associated with **MTCVs** configurations.

Outline of Suggested Content

➤ **Introduction**

- A. Vehicle familiarization.
- B. Definition of terms.

➤ **Tractor cab design**

- A. Conventional
- B. Cab over engine (COE)

➤ **Tractor axle configuration**

- A. Single axle (steer and one rear axle).
- B. Tandem axle (steer and two rear axle).
 - 1. Twin screw (both rear axles capable of power).
 - 2. Tag axle (one power axle, one dead axle).
 - a. Pusher (one power axle behind non-power axle).
 - b. Puller (one non-power axle behind power axle).

➤ **Basic full or semi trailer types with or without pintle hook**

- A. Basic width's 96 inch and 102 inch.
- B. Basic length vary from 27 foot to 48 foot.
- C. Dry box or freight trailers of varying lengths.
- D. Furniture vans of varying lengths.
- E. Refrigerated trailers of varying lengths.
- F. Flat bed trailers and car haulers of varying lengths.
- G. Tank (dry or liquid) trailers of varying lengths.
- H. Other specialized trailers of varying lengths some in excess of 48 feet long.

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➤ **Trailer axle configurations**

- A. Single axle .
- B. Tandem axle.
- C. Specialized axle configurations.

➤ **Converter dolly**

- A. Single axle, type A, B, or C.
- B. Tandem axle, type A, B or C.

➤ **Vehicle configurations**

- A. Tractor semitrailer.
- B. Western double or twin.
 - 1. A, B or C-train.
- C. Canadian double or twin.
 - 1. A, B or C-train.
- D. Rocky mountain double.
- E. Turnpike double.
- F. Triples.

➤ **Articulation factors**

- A. Number of axles.
- B. Number of articulation points.
- C. Type and number of converter dollies or draw bars.

➤ **Axle arrangement factors**

- A. Transfer of weight to pavement via axle arrangement.
 - 1. Number of axles.
 - 2. Spacing of axles.
- B. Width of axles 96 inch versus 102 inch.
 - 1. Roll stability,
 - 2. Cornering.
 - 3. Tracking and off-tracking.

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➤ Matched equipment factors

- A. Length of trailers.
- B. Width, 96 inch vs. 102 inch.
 - 1. Trailer body width vs. axle width.
 - 2. Effect on trailer placement.
- C. Weight of trailer.
- D. Age of equipment.
- E. Component compatibility of tractor and trailers.
 - 1. Hitching and dolly.
 - 2. Suspensions.
 - 3. Braking systems.

➤ Trailer placement rules, regulations and policies

- A. Trailers of equal length, the heavier trailer must lead.
- B. Trailers of equal weight, the longer trailer must lead.
- C. Trailers of unequal length.
 - 1. Regulations may require the longer trailer to lead.
 - 2. Regulations may require the heavier trailer to lead.

INSTRUCTIONAL OBJECTIVES

KNOWLEDGE OBJECTIVES

Driver must know:

- The name and function of basic tractor cab designs, types and axle configurations and their functional relationship to vehicle configuration.
- The name and function of basic trailer designs, types and axle configurations and their functional relationship to vehicle configuration.
- The name and function of basic converter dolly designs, types and axle configurations and their functional relationship to vehicle configuration.
- The name, components and function of various vehicle configurations to include standard tractor semitrailer, western doubles or twins, Canadian twins, rocky mountain doubles, turnpike doubles and Triples.
- The name, function and characteristics of A, B and C converter dollies and how they make up an A-train, B-train and C-train.

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- The factors affecting the articulation of various vehicle configurations to include number of axles, axle placement, axle width vs. trailer body width, trailer length, number of articulation points, and the type and number of converter dollies or drawbars.
- The component compatibility factors which affect the overall performance of a combination vehicle to include trailer(s) and dolly(s)' age, manufacturer, component (brakes, suspension, etc.) suppliers, etc.
- The basic rules, regulations and policies governing trailer placement,

ATTITUDE OBJECTIVES

The driver must believe:

- That proper trailer placement and weight distribution is a basic requirement for safe and efficient operation.
- That component compatibility factors are important and must be taken into consideration while operating combination vehicles.

Major supporting concepts

- 0 Tractor or Truck Tractor - The powered unit of a tractor-semitrailer with a cab and engine (almost always a diesel) but no freight compartment. At the rear of the tractor frame is the fifth wheel to which a semitrailer may be attached. Tractors have one axle in the front and one axle or a tandem axle in the rear.
- 0 Trailer - The cargo-carrying unit in a combination truck; it may be either a semitrailer or a full trailer (a trailer with axles at both ends).
- 0 Semitrailer - The most common type of cargo-carrying unit in a combination truck, consisting of a frame with either a single axle or a tandem axle at the rear. The front of a semitrailer has no axle; it rests on the rear axle of the vehicle in front of it (usually the tractor) in the combination, coupled by means of the fifth wheel. The body of a semitrailer may be a van (enclosed box), a tank or hopper for carrying liquid or dry bulk commodities, a flatbed for carrying large objects (logs, machinery, etc.), or one of many other types.
- 0 Axle - A steel shaft connecting the wheels.
- 0 Tandem Axle - A pair of closely spaced axles, typically about four feet apart.
- 0 Spread Tandem Axle - A pair of axles, typically nine feet apart.
- 0 Tractor-Semitrailer - The most common type of combination truck, comprising a tractor and one semitrailer. The five-axle tractor-semitrailer (three-axle tractor and two-axle semitrailer), typically 50 to 64 feet long and weighing 60,000 to 80,000 pounds when loaded, is the most common. The tractor-semitrailer legalized for nationwide use by the 1983 federal law has a semitrailer 48 feet long and 102 inches wide and a typical overall length that

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can range from 56 to 64 feet. The longest semitrailer in common use before 1983 was 45 feet.

- Dolly or Converter Dolly - The device most commonly used to couple the trailers of a multitrailer combination. It consists of a frame mounted on an axle with a hook-and-eye connection to the front semitrailer and a fifth wheel connection to the rear semitrailer. Dollies for twins have a single axle; dollies for the larger turnpike doubles have tandem axles. The forward connection of the dolly is usually a single eye that attaches to the pintle hook on the rear of the front trailer. An uncommon variant design, the B-dolly or double-drawbar dolly, has two parallel **drawbars** and two hook-and-eye connections to the front trailer. The connection between front trailer and the B-dolly is rigid, eliminating one articulation point between the two trailers. Some B-dollies incorporate a steering mechanism that allows the dolly axle to pivot during turns, reducing offtracking.
- Vehicle Configuration Definitions. The following definitions relate to the various configurations of heavy duty long combination vehicles:
 - Combination Truck -- A truck comprising two or more detachable units, usually a truck or tractor and one or more trailers or semitrailers.
 - Dolly -- A device with a single or tandem axle, that is designed to connect one short trailer to another. The dolly is a registered vehicle and it is not motorized. there appears to be at least four types of dollies:
 - A-dolly: The A-dolly is most common to multiple trailer use in the United States. The A-dolly is the single-drawbar dolly. The forward connection is usually a single eye that attaches to the pintle hook on the rear of the front trailer. The rearward connection is usually a conventional fifth wheel which is attached to the kingpin of the rearward trailer.
 - B-dolly: This device is the double-drawbar dolly. It has two parallel **drawbars** and two hook-and-eye connections to the front trailer. The connection between front trailer and the B-dolly is rigid. This eliminates one articulation point between the two trailers. This feature is said to reduce rearward amplification, the likelihood of rear trailer rollover, tire scrubbing and trailer sway. However, double-drawbar dollies can increase low-speed offtracking.
 - C-dolly: A double-drawbar (B-dolly) with a steering mechanism that allows the dolly axle to pivot during turns to reduce offtracking. The steer capability can be in the form of automotive (wheel) steer or turntable (axle) steer. Some persons referred to these devices as automotive or turntable "B-dollies".
 - Double or Double Tractor-Trailer -- A combination of a tractor with two trailers, usually both semitrailers. The front of the first semitrailer rests on the rear axles of the tractor and the front of the second semitrailer rests on a dolly. Other connection arrangements between the two trailers are

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sometimes used. Several types of double trailer trucks are in common use, classified by the arrangement of axles and the length of trailers. They are called: twin trailer truck (western double), turnpike double, and rocky mountain double.

- Rocky Mountain Double -- Double trailer truck that has a three-axle tractor, a tandem-axle semitrailer 40 to 45 foot long, a single-axle dolly, and a second 27 to 28 foot single axle semitrailer (seven axles in all). It is legal in 16 states.
- Turnpike Double -- A double trailer truck that has a three-axle tractor pulling two tandem-axle semitrailers, each typically 45 feet long, coupled by a tandem-axle dolly (nine axles in all). It is legal on at least some roads in 13 states.
- Twin Trailer Truck -- A double trailer truck that has a two-or-three axle tractor and two short single-axle trailers, each usually 27 or 28 feet long, coupled by a single-axle dolly. There are five or six axles in all. The most common is the five-axle unit (with two-axle tractor).
- Western Double -- Twin trailer truck that is named for its predominant use in western U.S. states. It is the most common doubles configuration in the U.S. fleet. It is the basic A-train and A-dolly configuration.
- Triple Trailers -- A tractor-semi-trailer-trailer-trailer combination with each trailing unit 26 to 28 feet in length.
- Triple Vehicle -- A straight truck (28 feet or more) pulling two trailing units of 26 to 28 feet in length.
- Twins -- Twin trailer trucks; Western Doubles: Tractor with two short trailers; Twin 28s.
- Loneer Combination Vehicles (LCVs) -- Since 1983, generally refers to rocky mountain doubles, turnpike doubles, and triples. The term LCVs is a general reference to longer combinations that require special permits. For purpose of this report, an LCV is any truck combination with 1) two trailers that have a combined trailer length longer than twin 28-foot trailers which are allowed nationwide, or 2) three trailers.
- A-Train -- An A-train is composed of a tractor-semi-trailer towing one or more full trailers made of a A-dolly and a semitrailer. An A-train consists of a tractor-semi-trailer pulling one or more conventional full trailers. The full trailer consists of a semitrailer whose forward end is supported by a single drawbar dolly that connects to its towing semitrailer with a single pintle hitch, and to the semitrailer it supports with a conventional fifth wheel or a turntable bearing -- the A-dolly.
- B-Train -- A B-Train is composed of a tractor towing two or more semitrailers. The towing trailers have an extended frame with fifth wheel for attaching the next trailer made of a B-dolly and semitrailer. The B-train is a multi-trailer vehicle employing only semitrailers, i.e., no full trailers. Each towing trailer is equipped with a rigid frame extension

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behind its cargo area that is fitted with a fifth wheel for coupling to the following trailer. The fifth wheel may be conventional, but often, and particularly on tank trailers, a so-called compensating fifth wheel may be used to reduce stress imposed on the frame. The improved rearward amplification performance of this vehicle in comparison to the A-train is well documented.

- C-Train -- A C-Train is composed of a tractor-semitrailer towing one or more trailers made of a B-dolly and semitrailer.
 - "STAA Vehicle" -- Refers to the wider (102 inch) and longer tractor-semitrailers (minimum trailer length of 48 feet) and twin trailer trucks (minimum trailer length of 28 feet) approved by the Surface Transportation Assistance Act (STAA) of 1982. These trucks can travel without restriction on a designated National Network of Interstate and other major highways.
- 0 The most common multi-articulated vehicle in operation in the US is a tractor-semitrailer pulling one or more full trailers. Each full trailer, in this case, consists of a semitrailer whose forward end is supported by a dolly which 1) articulates in yaw relative to the semitrailer, 2) is connected to the towing unit by a single pintle hitch, and 3) has one or more axles which are non-steering relative to the dolly frame. This configuration is commonly referred to as an A-train.
- 0 In addition to the number of axles, the fundamental differences among types of vehicles are the number of articulation points. These points are defined as hitches, pivot points, or connecting points.
- 0 The basic configuration, meaning the number of hitches, determines whether the vehicle is a single unit truck, truck with full trailer, tractor-semitrailer, twin, double, or triple.
- 0 A full trailer is any motor vehicle other than a pole trailer which is designed to be drawn by another motor vehicle and so constructed that no part of its weight, except for the towing device, rests upon the self-propelled towing unit. It can be made up of an auxiliary front axle called a "dolly" plus another semitrailer that contains the load. Hence, a tractor-semitrailer (TST) has one articulation point. A straight truck pulling a full trailer can have two articulation points. A double trailer unit can have three articulation points. A triples rig can have five articulation points.
- 0 Different LCV configurations strongly affect the operational characteristics of the vehicles. For example, turnpike doubles' trailers with longer wheelbases and fewer points of articulation lessen trailer sway (increasing stability) but add to low-speed off-tracking (decreasing maneuverability).
- 0 One inherent performance capability of the long double vehicle is the greater stability of the longer cargo units.

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- Some states have specific axle arrangement requirements for LCVs such as:
 - A few examples:
 - Alaska: Any axle spaced less than 10 feet away from any other axle, measured **between** the centers of the nearest axles, is considered part of an axle group,
 - Arizona: Axles must be designed for the width of the body.
 - Colorado: Vehicles shall not have fewer than six axles or more than nine axles. Axles must be designed for the width of the body.
 - Florida: A tractor, which will be used to haul a complete tandem-trailer (turnpike double) combination with a total gross weight of 110,000 pounds or more, shall be equipped with tandem rear axles and driving power shall be **applied** to all wheels on both axles. When the above tandem-axle tractor is required, a tandem-axle dolly converter must be used.
 - Indiana: Axles spaced less than 40 inches **between** centers are considered to be single axles. Axles spaced more than 40 inches but **less** than nine feet **between** centers are considered to be tandem axles.
 - Kansas: All axles, except steering axles, must have dual wheels. Drop and lift axles are prohibited. Vehicles may have a minimum of six and a maximum of nine axles.
 - Nebraska: Extra long vehicle combinations of not more than three cargo units shall have not less than six axles nor more than nine axles.
 - New York: A minimum 12-foot axle spacing **between** the fifth and sixth axles is **required** on a nine-axle LCV. The eight-axle LCV has no minimum **axle-spacing requirements**. Tandem combinations using single wheel tires commonly referred to as "Super Singles" are required to use triple axle tractors, dual-axle trailers, and dual-axle dollies
 - Ohio: The number of axles on a double shall be a minimum of five and a maximum of nine.
 - South Dakota: All axles except the steering axle require dual tires. Axles spaced eight (8) feet or less apart must weigh within 500 pounds of each other.
 - Utah: The use of single tires on any combination vehicle requiring an **overweight** or **oversize** permit shall not be allowed on single axles. A single axle is defined as one having more than 8 feet **between** it and the nearest axle or group of axles on the vehicle,
- It should be noted that the 102 inch (axle width) wide vehicle offers greater roll stability than the 96 inch width axle. The driver should recognize this factor.

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- 0 The overall length of the truck, the length of each trailer, the distance from the point of articulation to the rear axle of semitrailers, and the spread between consecutive axles influence the road space requirements of the truck, that is, turning & cornering ability and degree of off-tracking.
- 0 MTCV units should be composed of trailers of identical widths. Mixing trailers of different widths could create a safety hazard. A 96-inch wide trailer behind a 102-inch trailer can be difficult for the driver to see.
- 0 If a 102 inch wide trailer is placed on a converter dolly designed for 96 inch wide trailer, load overhang will result. This will enhance the potential for load rocking and shifting, especially on curves.
- 0 Rutted highways are of particular concern if axle widths of the converter dollies are narrower than those on the rear trailers. This arrangement can cause additional trailer sway because the narrower wheels of the converter dollies (96 inches) try to climb into the ruts, while the wider wheels on the rear trailers (102 inches) try to climb out.
- 0 Because fleets will always be interchanging trailers among different tractors and mating newer equipment to older equipment, compatibility will always be an issue.
- 0 Tractors and trailers are manufactured separately by different companies in separate segments. Broad ranges of performances exist for tractors, trailers, and other components. Some of the performance ranges may be incompatible with other parts of the vehicle system.
- 0 When mating trailers of equal length, the heavier trailer should always lead. The weight differential at which one trailer becomes "heavier" varies among states. A few states have determined the threshold of significant weight difference to be from 1,500 to 5,000 lbs. Some simply require the heavier of any two units in tandem to be the lead.
- 0 The length of the trailer may be a factor in it's placement if State regulations require the longer trailer first.
- 0 The reason for requiring certain trailer sequencing stems from brake-induced instability. A lightly loaded trailer when used in combination with a more heavily-loaded one, is likely to experience wheel lock-up under heavy braking before the more heavily-loaded units in the combination do so. If the light load is in the first trailer, this could lead to tractor jackknife or buckling of the entire combination unit in its middle section. If the light load is at the rear of the combination and locks up, it will experience trailer swing, which is more amenable to recovery than jackknifing.

MATERIALS

Classroom instruction must be supported by instructional material, syllabus, transparencies, wall charts, or individual class handouts which support the instructional objectives.

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SECTION 2 - Basic Operation

The units in this section cover the interaction between trainee drivers and the vehicle. They are intended to teach driver trainees how to inspect, couple and uncouple MTCVs, ensure the vehicles are in the proper operating condition, and control the motion of MTCVs under various road and traffic conditions.

During the range exercises in this section, the student will first familiarize himself/herself with basic backing principles utilizing a single trailer. The student will then become familiar with the basic operating characteristics of the MTCV. Utilizing the MTCV, the students must be able to perform the skills learned in each unit to a level of proficiency required to permit safe transition to on street driving.

Six units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS ROOM	LAB	RANGE	STREET	TOTAL HOURS
2.1	Inspection	2	4			6
2.2	Coupling And Uncoupling	2		4		6
2.3	Basic Control And Handling	0.75		3		3.75
2.4	Basic Maneuvers	0.75		8		8.75
2.5	Turning, Steering & Tracking	1		4		5
2.6	Proficiency Development	0.5		8	6	14.5
	TOTAL HOURS	7	4	27	6	44

HOURS OF BEHIND THE WHEEL DRIVER TRAINING		RANGE HR'S B-T-W			STREET HR'S B-T-W		TOTAL HOURS B-T-W
TYPE OF CONFIGURATION ➤		SEMI-TRAILER	PICK RM/TP	OTHER	PICK RM/TP	OTHER	
UNIT							
2.2	Coupling And Uncoupling	1	2	1			4
2.3	Basic Control And Handling		2	1			3
2.4	Basic Maneuvers	2	4	2			8
2.5	Turning, Steering & Tracking		2	2			4
2.6	Proficiency Development		4	4	4	2	14
	TOTAL HOURS	3	14	10	4	2	33

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2.1 Inspection

Purpose

This unit provides instruction on the systematic vehicle inspection of MTCV tractor trailers. This is to include pre-trip, **enroute**, and post-trip inspection procedures. While vehicle inspections are common in all commercial motor vehicle operations, some factors are peculiar to **MTCVs**. Emphasis is placed on component failure recognition.

Outline of Suggested Content

➤ **Introduction to vehicle inspections**

- A. Pre-trip vehicle
- B. Enroute
- C. Post-trip

➤ **Pre-trip inspection procedures**

- A. Details of a good inspection.
- B. Federal requirements.
- C. Inspection procedures.

➤ **Enroute inspection procedures**

- A. Details of a good inspection.
- B. Federal requirements.
- C. Inspection procedures.

➤ **Post-trip inspection procedures**

- A. Details of a good inspection.
- B. Federal requirements.
- C. Inspection procedures.

➤ **Additional procedures for reporting**

- A. Equipment lost, stolen, defective.
- B. Malfunctions or physical damage to tractor, trailers or dollies.
- C. Additional Company rules, policies, procedures.

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➤ What to check out when inspecting tractor, trailers and converter dollies

- A. Exterior lights.
- B. Horns working.
- C. Splash guards not damaged.
- D. Fluid levels and no signs of leaks.
- E. Belts and hoses.
- F. Steering system.
- G. Tires, wheels, lugs and rims.
- H. Spring & shock absorbers.
- I. Brakes drums and linings.
- J. Axle seals.
- K. Doors and mirrors.
- L. Emergency reflectors.
- M. Fuel tanks and battery box.
- N. Air & electrical lines ok.
- O. Fifth wheel assemblies.
- P. Landing gear & sliding tandems.
- Q. Brake system.
- R. Gauges.
- S. Heater & defroster,
- T. Windshield, wipers and windows,
- U. Panel lights & inspection stickers.
- V. Steering wheel.
- W. Fire extinguisher.
- X. Cargo & securement equipment (if present).

➤ Vehicle walk around sequence

- A. Introduction.
- B. Methodology.
- C. Steps to follow.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Inspect and determine the condition of critical combination vehicle components, including instruments and controls; engine and drive train; chassis and suspension; steering system; air brake system; converter dollies; coupling systems; emergency equipment; and cargo securement devices.
- Perform pre-trip inspections on **MTCVs** in a regular, systematic sequence that is accurate uniform and time efficient.
- Monitor the condition of the equipment **enroute** by checking instruments and mirrors signs of trouble while driving; make periodic inspections, and comply with regulatory requirements for **enroute** inspections when transporting hazardous materials.
 - While listening and feeling for indications of malfunctions is a normal part of performing **enroute** inspections, the driver of long doubles must be cautious to the fact sensory feedback is significantly less than when driving long doubles than for tractor semitrailers.
- Perform post-trip inspection by making accurate notes of actual and suspected component abnormalities or malfunctions.

KNOWLEDGE OBJECTIVES

Driver must know:

- Procedures for pre-trip, **enroute**, and post-trip vehicle inspection procedures.
- A systematic process to assure a rapid and complete inspection.
- The effect of undiscovered malfunctions upon safety, effectiveness, and economy.
- The importance of correcting malfunctions quickly before they pose a hazard to the driver or other road users.
- Federal, state, and other regulations governing vehicle inspections, including special regulations for hazardous materials cargo.

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ATTITUDE OBJECTIVES

The driver must believe:

- It is the drivers obligation to insure that the vehicle is in safe operating condition before taking it out on the road and to cease operating it if an unsafe condition is discovered.
- The consequence of breakdowns and accidents justify the time spent on the vehicle inspections.

Major supporting concepts

- Because of the greater number and flexibility of trailer couplings in MTCVs, drivers are less able to sense component failures or malfunctions such as brake imbalance, tire failure, suspension or coupling problems etc.
- During the first few miles of driving (during a trip), the driver conducts a deliberate test of all vehicle systems, The drivers refer to this as the three mile check. By doing this the driver is able to determine whether the truck is properly loaded and responding satisfactorily. It should also be noted that professional drivers continue to make these same kinds of deliberate system checks throughout their runs The three mile check is different in that it is more concentrated,
- The Model Driver's Manual for Commercial Vehicle Driver Licensing states that during a trip the driver should check critical items during stops. These are: Tires, brakes, lights, brake and electrical connections to trailers, trailer coupling devices and cargo securement devices.
- Before descending a long steep grade, the driver should stop at a pull-off area and make a vehicle check before descending the downgrade. On some extended grades, driver should stop and cool brakes before completing the long downhill descent,

MATERIALS

Classroom instruction must be supported by visual aids that demonstrate characteristics of vehicle malfunctions, their appearance, detection, and the adverse consequences of not identifying a vehicle malfunction. Also required are printed or visual materials that describe common malfunctions and the frequency with which they are encountered.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or vehicle safety inspection criteria work sheet,

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TRAINEE CHECKLIST: VEHICLE SAFETY INSPECTION

A. EXTERIOR LIGHTS

PASS FAIL

1. Demonstrates high and low beam headlights, signals, brake lights, emergency flashers and clearance lights.

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B. HORNS

1. Demonstrates horn works properly. (air & electric)

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C. SPLASH GUARDS

1. Demonstrates splash guards are present, firmly attached and are not damaged.

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D. FLUID LEVELS & LEAKS

1. Demonstrates method of checking fluid levels. This includes radiator, motor oil, transmission fluid (if accessible), and power steering fluid.
2. Checks for Fluid Leaks.

E. BELTS AND HOSES

1. Identifies and checks condition of belts and hoses.
This is to include but not limited to: (Circle item missed)

Belts

alternator
air compressor
fan / water pump
air conditioner

Hoses

power steering
water & radiator
smog pump
fuel

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F. STEERING SYSTEM

1. Identifies and checks condition of steering gear box, pitman arm, steering knuckle arm, lower control arm and tie rod ends.

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G. TIRES, WHEELS, LUGS, RIMS

1. Checks tires for same height, width, type, excessive / unusual tread wear, bumps, cuts, duals not touching, objects between duals, etc.
2. Checks wheels / rims for cracks, welds, bent rims or other damage.
3. Checks all lugs are present and tight. Looks for rust around lugs.
4. Checks hub odometer for damage.

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H. SPRINGS AND SHOCK ABSORBERS

1. Checks springs, for missing or broken leaves or poor alignment.
* Air ride bellows not leaking, properly inflated.
Height control arm not bent, operating properly.
2. Check for loose or broken U-bolts, spring hangers or shackles.
3. Checks for loose, broken or leaking shocks.

PASS FAIL

I. BRAKES, DRUMS, LININGS

1. Checks condition of brakes including linings and drums for excessive or unusual wear or damage.
2. Checks push rods and slack adjusters for proper adjustment.

J. AXLE SEALS

1. Checks axle seals for exterior cracks or leakage around wheel hubs.

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K. DOORS AND MIRRORS

1. Checks that passenger & cargo doors operate UK, hinges are functional & doors are secure.
2. Checks mirrors for proper mounting, adjustment, damage, and visibility.
3. Grab handles secure, no loose or missing bolts.

L. EMERGENCY REFLECTORS

1. Identifies locations of reflectors. All are in fully serviceable condition. (three required)

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M. FUEL TANKS & BATTERY BOX

1. Checks that tanks are not damaged and are secure, cap gasket is in place, caps are tight and there is no leakage.
2. Checks crossover line for leaks.
3. Checks battery box mounting, & cover. Batteries secured against movement, cases not damaged or leaking. Fluid in batteries at proper level, cell caps secure.

N. AIR / ELECTRICAL LINES AND CONNECTORS

1. Checks air & electrical lines for damage and/or leaks.
2. Checks that connectors are in good condition and firmly attached.

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O. FIFTH WHEEL ASSEMBLY (TRACTOR & DOLLY)

PASS FAIL

1. Identifies the following parts:
 - a. King pin,
 - b. Lucking pin,
 - c. Safety latch,
 - d. Release handle.
2. Checks that fifth wheel assembly does not have broken or damaged parts, that assembly is firmly attached to tractor or dolly, and that trailer is firmly attached to the fifth wheel.

P. LANDING GEAR / SLIDING TANDEM

1. Checks that landing gear is fully raised, has no missing or damaged parts and handle is secured.
2. Sliding tandem is locked & has no visible damage, worn or missing parts. Flexible air lines not cracked, crimped or otherwise damaged. Lines are secured against tangling, dragging, etc.

Q. BRAKE SYSTEM

1. Air compressor cuts in at 85 PSI. Minimum.
2. Air compressor cuts out at 125 PSI max.
(Acceptable cut out range 110 to 125 PSI)
3. **Static** pressure loss no greater than 3 PSI for a combination vehicle. (2 PSI single vehicle)
4. **Applied** pressure loss no greater than 4 PSI for a combination vehicle. (3 PSI single vehicle)
5. Low pressure warning device (light or alarm) activates at 50% maximum governed air pressure (on or before 60 PSI).
6. Emergency / parking system operates properly.
Emergency brake sets up between 20 and 45 PSI.
7. Pull test tractor park brake .
8. Rolling brake test complete system.

R. GAUGES (OTHER THAN AIR)

Identifies and explains the following gauge / readings

- 1. Oil Pressure
- 2. Fuel
- 3. Temperature
- 4. Ammeter/Voltmeter
- 5. Speedometer
- 6. Tachometer
- 7. Brake application
- 8. _____

PASS FAIL

S. HEATER / DEFROSTER

- 1. Identifies and activates heater / defroster.

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T. WINDSHIELD, WIPERS AND WINDOWS

- 1. Windows free of any condition which obstructs view of driver or passenger.
- 2. Wipers function properly.

U. PANEL LIGHTS / INSPECTION STICKER

- 1. Identifies indicator lights on instrument panel.
- 2. Identifies and explains the purpose for inspection sticker.

V. STEERING WHEEL

- 1. Steering wheel play not in excess of 10 degrees.

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W. FIRE EXTINGUISHER

- 1. Secure in holder.
- 2. Inspection plate. Classification _____.
- 3. Pressure gauge works. (charged)
- 4. Wire / plastic seal unbroken.
- 5. Pin secured. (if applicable)
- 6. Inspection tag dated within 12 months

TOTALS:

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FINAL SCORE:

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2.2 Coupling and Uncoupling

Purpose

This unit provides instruction on the procedures for coupling and uncoupling MTCVs. While vehicle coupling and uncoupling procedures are common in all tractor semitrailer operations, some factors are peculiar to MTCVs. Emphasis is placed on preplanning and safe operating procedures.

Outline of Suggested Content

➤ Introduction to hitching mechanisms

- A. Tractor fifth wheel.
- B. Trailer kingpin and bed plate or skid plate.
- C. Pintle hook.
- D. Converter dollies.
 - 1. A-dolly, single **drawbar**.
 - 2. B-dolly, double **drawbar**.
 - a. Nun steering capability.
 - b. Wheel steering capability.
 - 3. C- dolly, double **drawbar** with steering mechanism.
 - 4. Jifflox
 - a. Used as a converter dolly for hooking second trailer.
 - b. Can also be rigidly lucked into frame of tractor to add a second axle.
 - 5. Draw bar.
 - 6. Safety chains or cables.
 - 7. High speed yaw locking mechanisms and snubber devices.

➤ Combination vehicle air brakes

- A. Trailer hand valve.
- B. Tractor protection valve.
- C. Trailer air supply control.
- D. Trailer air lines.
- E. Hose couplers.

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F. Trailer air tanks.

G. Shut off valves.

1. Rear of trailers.

2. Converter dollies air tank drain valves.

H. Trailer service, parking and emergency brakes.

➤ **Staging of equipment**

A. Locate equipment to be coupled.

B. Preplan location to perform coupling sequence.

C. Confirm adequacy of location to assure sufficient room for safe maneuvering.

D. Inspect equipment for readiness.

➤ **Coupling routine includes**

A. Maneuver.

B. Inspect for readiness.

C. Hook first trailer.

D. inspect & test coupling.

E. Maneuver.

F. Inspect for readiness.

G. Hook converter dolly.

H. Hook second trailer.

I. Inspect / test coupling of tractor-trailer-dolly-trailer unit.

➤ **Detailed step by step coupling procedures**

A. Follow checklist.

➤ **Detailed step by step uncoupling procedures**

A. Follow checklist.

➤ **Summary of safety concerns**

A. Proper procedures reduce the likelihood of accidents occurring.

B. Examples of accidents caused by improper coupling or uncoupling.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Align the tractor properly to connect with the trailer.
- 0 Secure the trailer against movement.
- 0 Back the tractor properly into the trailer kingpin without damage.
- 0 Align the tractor and trailer properly to connect with the dully and trailer.
- 0 Properly connect the converter dolly to the lead trailer.
- 0 Connect electrical and air lines properly.
- 0 Back the converter dolly into the rear trailer kingpin without damage.
- 0 Perform mechanical and visual checks to make sure couplings are secure.
- 0 Set in-cab air brake controls properly.
- 0 Retract and secure landing gears **after** couplings are secure.

KNOWLEDGE OBJECTIVES

Driver must know:

- The name, location and function of each of the primary controls, instruments and gauges required for coupling and uncoupling MTCVs.
- The name, location and function of all of the hitching mechanisms and their associated components required to couple and uncouple MTCVs. This is to include fifth wheels, kingpins, converter dollies, jifflux, **drawbar**, pintle hook, etc.
- The name, location and function of all of the air brake and electrical components required to couple and uncouple MTCVs. This is to include trailer hand valve, air tanks, air lines, electrical lines, shutoff valves etc.
- The order, sequence and direction of vehicle manipulations and movements required to properly position the tractor, lead (first) trailer, converter dolly, and rear (second) trailer for a safe and successful coupling and uncoupling.
- The procedures for pulling various converter dollies safely.
- The hazards of improper coupling and uncoupling.

SKILL OBJECTIVES

Driver must:

- Align the units, tractor, first (lead) trailer, dully, second (rear) trailer.

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- Back the trailer to achieve sufficient force to lock the fifth wheel on the tractor and/or converter dolly to the kingpin on the first (lead) and second (rear) trailer without damaging the kingpin.
- Pull against the kingpins to check the connections without abusing the equipment.

ATTITUDE OBJECTIVES

The driver must believe:

- Following proper coupling and uncoupling procedures is important and will reduce the likelihood of injury or accidents.
- Careless coupling and uncoupling is very dangerous.
- That accidents caused by improper coupling and uncoupling are always preventable.

Major supporting concepts

- Fifth Wheel: A horizontal circular plate mounted over the rear axle of a tractor with a hole in the center into which a vertical pin under the front end of a semitrailer fits to couple the two units together. The fifth wheel is the pivot point between the tractor and semitrailer and bears the weight of the front of the semitrailer.
- Pintle Hook: A fixed upright hook extending from the rear of the frame of a trailer to be used in a double trailer truck. An eye at the front of the dolly in a combination hooks to the pintle hook on the front trailer to connect the two units.
- Dolly or converter gear: The device most commonly used to couple the trailers of double units. The dolly consists of a frame mounted on an axle (single or twin) with a hook-and-eye connection to the front semitrailer and a fifth wheel connection to the rear semitrailer. The forward connection of the dolly is usually a single eye that attaches to the pintle hook on the rear of the front trailer.
- Draw Bar: A draw bar is a beam which serves as a point of connection for other trailers. Some states require the length of the draw bar to be the practical minimum consistent with the clearance between trailers for turning and braking maneuvers.
- Snubber: Slack eliminating device on tongue of converter dolly or pintle hook.
- A-dolly: The most common to multiple trailer use in the United States. The A-dolly is the single-drawbar dolly. The forward connection is usually a single eye that attaches to the pintle hook on the rear of the front trailer.
- B-dolly: This device is the double-drawbar dolly. It has two parallel drawbars and two hook-and-eye connections to the front trailer. The connection

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between front trailer and the B-dolly is rigid. This eliminates one articulation point between the two trailers. This feature is said to reduce rearward amplification, the likelihood of rear trailer rollover, tire scrubbing and trailer sway. However, double-drawbar dollies can increase low-speed offtracking.

- Compared with the single-drawbar dolly, such B-dollies are heavier, more costly to buy and maintain, and possibly more difficult to hitch.
- C-dolly: A double-drawbar (B-dolly) with a steering mechanism that allows the dolly axle to pivot during turns to reduce offtracking. The steering mechanism can be automotive (wheel) or turntable (axle) in design.
- There appears to be at least four types of dollies:
 - A Single-drawbar "A-dolly".
 - B Double-drawbar, non-steering "B-dolly".
 - c "B-dolly" equipped with automotive (wheel) steer capability.
 - D "B-dolly" equipped with turntable (axle) steer.
 - (Note: Types C and D may be referred to as "C-dollies")
- Jifflox: "Jifflox" is the trade name for a special converter dolly that can be lucked into an existing tractor to add an axle. Most converter dollies are used only for hooking up the rear trailers and include one set of wheels and a fifth wheel.
 - The Jifflox may be used either for hooking a rear trailer or for hooking into an existing tractor in order to give the tractor a second rear axle. When this is done, the fifth wheel that is already on the tractor is moved forward and the first trailer is attached to the fifth wheel on the Jifflox. The Jifflox has a special locking mechanism that locks into the frame of the tractor and thus does not add an extra point of articulation when used in this way.
- Integral Dolly: A dolly rigidly connected to the trailer frame. The so-called "B-train" configuration with an integral dolly requires that the trailer frame of the front trailer be extended beyond the rear of the payload bed in order to mount a fifth-wheel to connect additional trailers.
 - Extending the frame of the front trailer, however, makes unloading that trailer difficult and also limits the use of that trailer to the front or middle trailing unit of a longer combination. These factors make B-train configurations impractical for conventional van-type trailers.
- The order, sequence and direction of vehicle manipulations and movements required to position the tractor and/or one or both of the trailers in position for safe and successful coupling is a major safety consideration.
- To aid the driver in lining up units and to guide the driver during the hooking maneuver, a reference marker should be used to help the driver identify the hook up points.

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- 0 After "maneuvering the vehicle" the FHWA-OMC lists steps for "inspecting vehicle components" for readiness to be coupled. This indicates that a "pre-coupling" inspection should be performed.
- 0 The A-dolly is a remarkably simple, inexpensive, light, low maintenance, practical device with no drawbacks other than it significantly contributes to the rearward amplification phenomenon.
- 0 A high percentage of company accidents occur while coupling trailers. In almost every case, if the correct procedure had been followed, the accident would have been prevented.
- 0 When handling the converter dolly, exercise precaution in lifting and moving to avoid slipping and straining a muscle. Use a pintle hook equipped tractor to move the dolly.
- 0 Be on guard when hooking the dolly eye to the pintle hook to ensure hands and fingers are not injured.
- 0 Safety chains must be attached to the frame of the towing unit,
- 0 A converter gear dolly used in a combination of vehicles may have one or more axles and must be equipped with safety chains or cables to be secured to the vehicle pulling the dolly. The combination of any safety chains or cables used must be strong enough to prevent the dolly from completely separating from the vehicle which is pulling it if the hitch on the dolly fails.
- 0 Because of the greater number and flexibility of trailer couplings in MTCVs, their drivers are less able to sense component failures or malfunctions such as brake imbalance, tire failure, suspension or coupling problems etc.
- 0 To aid the driver in lining up units and to guide the driver during the hooking maneuver, a reference marker should be used to help the driver identify the hook up point.
- 0 When handling the converter dolly, exercise precaution in lifting and moving to avoid slipping and strain. Use a pintle hook equipped tractor to move the dolly. Be on guard when hooking the dolly eye to the pintle hook to ensure hands and fingers are not injured.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that demonstrate coupling and uncoupling MTCVs. Also required are printed or visual materials that describe common hazards associated to coupling and uncoupling MTCVs and the consequences of improper procedures.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or coupling and uncoupling criteria work sheet.

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UNIT 2.2 COUPLING AND UNCOUPLING CHECKLIST

1. Coupling sequence overview

- A. Locate rear trailer and spot the assigned converter dolly in line with and in front of rear trailer.
- B. Locate lead trailer and hook up to it in a normal manner. Inspect & test coupling.
- C. Align and back lead trailer to a reference point in front of rear trailer.
- D. Hook converter dolly to lead trailer and make appropriate air, electrical and safety chain / cable connections and perform safety checks.
- E. Back tractor-lead trailer-dolly unit under rear trailer until hook is made.
- F. Raise landing gear and make all necessary electrical and air line connections.
- G. Perform all final safety checks and inspect & test coupling of tractor-trailer-dolly-trailer unit.

2. Coupling tractor to trailer

- A. Inspect fifth wheel for damage, missing parts, grease, jaws open, safety unlock handle in automatic lock position, fifth wheel slider locked (if so equipped).
- B. Inspect trailer kingpin and skid plate for damage, inspect area around vehicles and chock wheels.
- C. Position tractor in front of trailer and back slowly up to trailer nose.
- D. Secure tractor, get out and check trailer height, adjust if necessary
- E. Connect air lines to trailer and from the cab supply air to trailer.
- F. Lock trailer brakes and back under trailer.
- G. Check connection by slightly raising landing gear and pull forward gently while the trailer brakes are still locked.
- H. Secure vehicle and visually inspect coupling, connect electrical cord and check air lines.
- I. Raise landing gear, secure crank handle, check clearances for tractor frame and tires. If trailer is equipped with sliding wheels, check locking mechanism and position, remove trailer wheel chocks and prepare to leave.

3. Set up second trailer and converter dolly

- A. Release dolly brakes by opening air tank petcock or use dolly parking brake control if so equipped.
- B. Position converter dolly in front of second (rear) trailer.

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4. Coupling to converter dolly and second trailer

- A. Position tractor-trailer as close as possible to converter dolly.
- B. Move dolly to rear of first trailer and couple it to the pintle hook.
- C. Lock pintle hook and secure dolly support in raised position.
- D. Make sure trailer brakes are locked and/or wheels chocked.
- E. Make sure trailer height is correct and back converter dolly under rear trailer.
- F. Raise landing gear slightly and test coupling by pulling against pin of rear trailer.
- G. Visual check coupling and connect safety chains, air hoses & light cords,
- H. Close converter dolly air tank petcock, and shut off valves at rear of second trailer (service and emergency shut-offs).
- I. Open shut-off valves at rear of first trailer and on dolly if so equipped.
- J. Raise landing gear completely, secure crank handle and remove wheel chocks.
- K. Charge trailers (push "air supply" knob in) and check for air at rear of second trailer by opening the emergency line shut-off. If air pressure isn't there, something is wrong and the brakes won't work.

5. Pulling a converter dolly

- A. Connect the converter dolly to the lead trailer, assuring the pintle hook is closed and locked, light cord and safety chains attached.
- B. Connect the emergency air lines in the following manner:
 - 1. Connect the emergency air lines from the converter dolly to the rear of the lead trailer emergency air glad hand.
 - 2. Connect the other end of the emergency air line from the converter dolly to the service glad hand of the lead trailer.
- C. Open the emergency glad hand shut off valve and close the service glad hand shut off valve. NOTE: This procedure is used to assure that there is an emergency air supply to operate the ram on the pintle hook and to automatically set up the dolly brakes in case of breakaway. It is undesirable, however, to have service air actuate the dolly brakes during normal braking of the tractor and the dolly brakes during normal braking of the tractor and trailer. The light weight of the dolly, when not under load, will allow the brakes to lock up, resulting in tire damage or failure.
- D. Connect the two ends of the converter dolly service air lines together and stow them. This will keep dirt from entering the lines and from dragging on the ground.

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6. Uncoupling rear trailer

- A. Park rig in a straight line on firm ground. Apply parking brakes so rig won't move. Secure second trailer by chucking the wheels if second trailer doesn't have spring brakes.
- B. Lower landing gear of second trailer enough to remove some weight from fifth wheel of converter dolly.
- C. Close air shut-offs at rear of first (lead) trailer and on dolly if so equipped.
- D. Disconnect all dolly air and electrical lines and secure them.
- E. Release dolly brakes.
- F. Release converter dolly fifth wheel latch.
- G. Slowly pull tractor, lead trailer and dolly forward, out from under rear trailer.

7. Uncouple converter dolly

- A. Lower dolly landing gear and disconnect safety chains.
- B. Apply converter gear spring brakes and/or chock wheels.
- C. Release pintle hook on first (lead) trailer.
- D. Slowly pull clear of dolly.

Caution

Never unlock the pintle hook with the dolly still under any trailer. The draw bar may fly up, possibly causing injury, and making it very difficult to re-couple.

8. Uncouple tractor from lead trailer

- A. Park rig in a straight line on firm ground. Shut off trailer air supply to lock trailer brakes. Ease pressure on fifth wheel locking jaws by backing up gently. Apply parking brakes while tractor is pushing against kingpin. This will release pressure on fifth wheel locking jaws and lever.
- B. Secure lead trailer by chucking the wheels if lead trailer doesn't have spring brakes.
- C. Lower landing gear of lead trailer enough to remove some weight from tractor.
- D. Disconnect all tractor air and electrical lines and secure them.
- E. Release fifth wheel latch by pulling release handle to open position.
- F. Slowly pull tractor forward, unlocking kingpin and stop while tractor frame is still under trailer. Secure tractor, inspect trailer supports, then pull out completely.

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2.3 Basic Control and Handling

Purpose

This unit provides an introduction to basic vehicular control and handling as it applies to MTCV tractor trailers. This is to include instruction on brake performance, handling characteristics and factors affecting MTCV stability while braking, turning and cornering. Emphasis is placed on safe operating procedures.

Outline of Suggested Content

➤ Putting the vehicle in motion

- A. Importance of lap / shoulder belts.
 - 1. Proper use and function.
 - 2. Safety issues for driver and other road users
 - a. Increased control of vehicle in emergency reaction maneuvers.
 - b. Increased safety for driver.
 - c. Reduce incidence of driver ejection.
- B. Shifting
 - 1. Double clutching.
 - 2. Timing upshift and downshift.
 - 3. Consequences of improper shifting.
 - 4. Progressive shifting techniques.
- C. Testing the tractor-multiple-trailer hookup.
 - 1. How to test the brakes.
 - 2. Feel for imbalance.
 - 3. Visually check if in doubt.

➤ Stopping the vehicle.

- A. Basic procedures.
 - 1. Smooth deceleration.
 - 2. Positioning for next move.
 - 3. Avoid having to backup.
 - 4. If parking, plan your exit before you park.

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➤ **Braking performance is a function of stopping distance and vehicle controllability.**

A. Stopping distance is influenced by a number of factors to include:

1. Friction available between tires and pavement.
2. Brake system characteristics.
3. Distribution of weight on individual axles.

B. Vehicle controllability during brake application is influenced by:

1. The number of axles, articulation points and brake balance between units.
2. The ability to maintain directional control and avoid wheel lock up.
3. The probability that the wheels on one or more axles may lock up.

➤ **Vehicle characteristics**

A. LCV's have different handling characteristics than semi's.

B. Every vehicle has its own handling and performance characteristics.

C. Combining and or exchanging units changes the handling characteristics of the combined vehicle.

D. Empty MTCVs are inherently less stable than loaded MTCVs.

➤ **Handling and stability characteristics**

A. Are affected by:

1. Height of the center of gravity of the cargo being carried.
2. The distribution of the cargo within the trailers.
3. The type of coupling devices used.
4. Road and weather conditions.

B. The handling and stability characteristics most related to safety that are influenced by truck weight, size, and articulation are:

1. Off-tracking.
2. Response to rapid steering.
3. Sensory feedback.
4. Braking.
5. Oscillatory sway.
6. Yaw stability and rollover in steady turns.

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➤ Summary of safety concerns

- A. Proper procedures reduce the likelihood of accidents occurring.
- B. Impaired sensory feedback to the driver.
 - 1. Greater number of trailer couplings in MTCVs.
 - 2. Increased overall flexibility of unit.
- C. Examples of accidents caused by improper procedures.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Perform mechanical and visual checks to make sure coupling is secure.
- Start, warm up and shut down the engine, according to manufacturer's specifications.
- Properly secure himself/herself in the seat using the lap / shoulder belt prior to putting the vehicle into motion.
- Put the vehicle in motion, and accelerate smoothly using double clutching technique.
- Select proper gear for speed and road conditions.
- Bring the vehicle to a smooth stop minimizing any vehicle instabilities.
- Maintain directional control and minimize any vehicular instabilities while making maneuvers.

KNOWLEDGE OBJECTIVES

Driver must know:

- The name, location and function of each of the primary controls, instruments and gauges required for coupling and uncoupling MTCVs.
- The name, location and function all of the air brake and electrical components required to couple and uncouple MTCVs. This is to include trailer hand valve, air tanks air lines, electrical lines, shutoff valves etc.
- The shifting pattern, procedures, instruments and controls necessary to shift gears properly.
- The manufacturer's specifications for engine operation.
- The procedures for carrying out the performance objectives.
- The relationship of wheel base length, articulation, and the number of axles to path of a turn.

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- The factors which affect vehicular stability and handling.
- The handling and stability characteristics most related to safety that are influenced by truck weight, size, articulation and road conditions.

SKILL OBJECTIVES

Driver must:

- Coordinate use of accelerator and clutch (double clutching technique) to achieve smooth acceleration and avoid clutch abuse.
- Properly modulate air brakes to bring vehicle to a smooth stop with no visible signs of instabilities.
- Adequately judge the stopping distance of unit while in the process of bringing the vehicle to a smooth stop.
- Coordinate steering, braking and acceleration to take the vehicle through a desired path of travel with no visible signs of instabilities.

ATTITUDE OBJECTIVES

The driver must believe:

- That use of the lap / shoulder belt will increase his / her safety and the safety of other road users.
- That following correct starting, warm-up, braking, turning and cornering procedures is essential to safe and economical vehicle operation.

Maior supporting concepts

- Under 49 CFR 392.16, the FHWA requires that " a motor vehicle which has a seat belt assembly installed at the driver's seat shall not be driven unless the driver has properly restrained himself/herself with the seat belt."
- Surveys have suggested that some truck drivers do not believe that restraint systems will afford them a measurable degree of protection in the event of a crash. Some believe that it is best to be thrown from a vehicle in an accident. Although there is clear evidence that restraint use saves lives, some truck drivers apparently believe this to be true only for passenger vehicles. Such beliefs among truck drivers highlight the need for improved education regarding restraint use.
- The two major components of truck braking performance are stopping distance capability and vehicle controllability during brake applications.
- Stopping distance, measured by the distance it takes for a truck to come to a complete stop after brakes have been applied at a given speed, is influenced by a number of factors, including friction available between tires and pavement, brake system characteristics, and distribution of loads on individual axles.

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- 0 The more axles on a vehicle and the more articulation points it has, the more difficult it is to balance the brake forces and brake timing between power unit and trailing units.
- 0 Safe operation requires the vehicle to be able to stop within a reasonable distance without the tractor or trailer units swerving out of their lane.
- 0 Although MTCVs are larger and sometimes heavier than tractor-semitrailers, there is no perceptible difference in their braking ability, because their brake systems are designed to provide the required torque for the loads carried. There are more braked wheels on the road.
- 0 Braking controllability is the ability both to maintain directional control and to avoid instabilities such as jackknifing and trailer swing during the braking maneuver.
- 0 Vehicle controllability during braking is related to lockup of the wheels on one or more of the axle sets. When pneumatic tires lock up, or cease to rotate, they are unable to produce the lateral forces necessary for directional stability and control. When lockup occurs on the wheels of the steering axle, the vehicle is unsteerable. When lockup occurs on the wheels of the tractor's rear axle or on the wheels of a dolly's axle, the tractor or dolly is unstable in yaw; the ensuing rapid rotational motion is commonly termed jackknifing. Finally if the wheels of the rearmost trailer axle lockup, that end of the trailer swings outward, a condition commonly termed trailer swing.
- 0 Properly adjusted brakes are critical for MTCV trailers because of the increased number of brakes that must be balanced and work in the proper sequence.
- 0 The trailer brake hand valve (if available in the tractor) should not be used for normal or emergency braking. The use of the hand valve, instead of normal foot braking, results in reduced effectiveness and excessive wear of the trailer brakes. This could lead to trailer brake fade or failure. Brake fade on any axle will lead to brake imbalance and reduce overall braking ability affecting stopping distance and vehicle control during braking.
- 0 Stopping distances will vary depending on a number of factors such as the drivers' skill, the equipment used, the load distribution, and road conditions.
- 0 Studies show that braking is more complex for MTCVs than for single-trailer trucks because of the greater number of brakes that must be properly adjusted and activated in the proper sequence (last trailer's first). Mechanical devices called automatic slack adjusters can help maintain brakes' proper adjustment when they are properly installed and maintained.
- 0 The load distribution between MTCV trailers can be of critical importance. If the last trailer is empty or only partially loaded, the brakes, designed for a fully loaded condition, can overbrake the trailer and as a result potentially cause the wheels to "lock up". Antilock brakes, while still being tested, may lessen this problem and help to provide the driver with better control of the vehicle.

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- 0 Because of their additional articulation points, greater length and different load distribution, MTCVs have different handling characteristics than tractor-semitrailers.
- 0 MTCV drivers must be well acquainted with the capabilities and limitations of their vehicle. Every vehicle, whether tractor only, tractor and single trailer, twins, doubles, or a set of triples has its own handling and performance characteristics. Drivers must achieve confidence and acquire familiarity with the type of vehicle and the specific vehicle that is to be driven.
- 0 The height of the center of gravity of the cargo being carried, the distribution of the cargo within the trailer, the type of connectors being used, and the conditions of the road, are all factors which can affect the stability of MTCVs.
- 0 The type of trailers being pulled and the product or cargo contained in the trailer, can affect the stability of MTCVs. By example, tank trailers loaded with liquid product can experience surge of the product, which can influence stability and handling dynamics.
- 0 Drivers of MTCVs must develop a special kinesthetic or body "feel" for the trailing units. Much of this "feel" is developed through experience.
- 0 Empty MTCV trailers are inherently less stable than loaded MTCVs units, since the suspension system is set up to perform under maximum load.
- 0 Trailer sway, the side-to-side movement of multiple trailers, can be caused by poor maintenance of critical connecting mechanisms (points of articulation), uneven distribution of the load, incompatible or inadequate equipment, rutted highways, or wind gusts.
- 0 Rearward amplification -often called the "crack the whip" effect - is usually initiated when drivers make sudden steering maneuvers to avoid obstacles.
- 0 The stability and control characteristics of heavy trucks (MTCVs) are direct indicators of their safety performance. This is because the driver's ability to control his / her vehicle -- that is, his / her ability to make it go in the direction he/she chooses at the speed he/she chooses -- is ultimately limited by the response of the vehicle to steering and braking inputs.
- 0 MTCV drivers should know the handling characteristics of their equipment. Every vehicle has its own handling characteristics. Drivers must demonstrate confidence executing: left and right 90 degree turns, button hook turns, braking without rebound, passing, mirror use and smooth steering.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that illustrate basic control exercises and define handling characteristics of MTCVs. Also required are printed or visual materials that describe common hazards encountered by MTCVs and the consequences of improper safety procedures.

On-range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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2.4 Basic Maneuvers

Purpose

This unit provides instruction on the basic vehicular maneuvers which will be encountered by MTCV drivers. This is to include instruction on backing, lane positioning and path selection, merging situations and parking MTCVs. Emphasis is placed on safe operating procedures as they apply to brake performance and directional stability while accelerating, braking, merging, cornering, turning and parking.

Outline of Suggested Content

➤ Backing

A. With single trailer.

1. Steering principles.
2. Rules for safe backing.
3. General procedures
4. Types of backing maneuvers and their application to coupling second unit.
 - a. Straight line backing maneuver.
 - b. 45 degree alley / dock backing maneuver.
 - c. Jackknife backing maneuver
 - d. Parallel park backing maneuver,

B. With MTCV trailers coupled.

1. Backing should be avoided.
2. Difference with different converter dollies.
 - a. A-dolly, single drawbar.
 - b. B-dolly, double drawbar.
 - Non steering capability.
 - Wheel steering capability.
 - c. C- dolly, double drawbar with steering mechanism.
 - d. Jifflox

➤ Parking MTCVs

A. Always use pull through parking spaces without pull out obstruction.

- Because parking is most difficult backing maneuver.

B. Always plan your exit before your park,

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C. Always apply parking brake and chock wheels unless

1. Brakes are very hot.
 - a. Then chock wheels, stop engine, put transmission in gear, and let brakes cool.
2. Brakes are wet in freezing weather.
 - a. Then use brakes lightly before parking to heat up and dry brakes.

➤ Lane positioning and path selection

A. Laws, rules and regulation may restrict lane usage.

B. Select (legal) lane offering:

1. Best mobility.
2. Least traffic interference.

C. Straight driving vehicle centered in lane of travel.

1. Coordinate steering input to minimize over or under steering.

D. Curves

1. Speed adjusted for curve prior to entering curve.
 - a. **Never shift, brake or heavily decelerate in a curve.**
2. Adjust position in lane prior to entering curve to allow for off-tracking.
 - a. **Never cut across a lane to straighten out a curve.**
3. Hold lane position without drifting or weaving.
4. Accelerate gently / steadily in curve, pulling the trailers through curve.

➤ Merging

A. Steps for merging onto roadway or freeway from entrance.

1. Check main road for traffic using window and current roadway using mirrors.
2. Activate signal while in acceleration lane.
3. Align the rig with roadway to observe overtaking traffic using mirrors.
4. Adjust speed to as close to the highway speed as possible while in the acceleration lane.
 - a. **Do not over accelerate (speed) on ramp.**
5. Enter roadway and cancel signal.

B. Steps for merging into gaps in traffic

1. Look for gap and signal intention for gap.

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2. Align the rig with the roadway to observe overtaking traffic using mirrors.
3. Find, locate or select gap.
4. Adjust speed to as close to the speed of the other traffic as possible.
5. Enter gap and cancel signal.

C. Safety concerns:

1. Ramp speed, length and superelevation.
2. Insufficient acceleration speed or lane length.
3. Insufficient gap in the traffic.
 - a. Forced to slow down.
 - b. Forced to stop.

➤ **Summary of safety concerns**

- A. Proper procedures reduce the likelihood of accidents occurring.
- B. The handling and stability characteristics most related to safety that are influenced by truck weight, size, and articulation are:
 1. Off-tracking.
 2. Response to rapid steering.
 3. Sensory feedback,
 4. Braking.
 5. Oscillatory sway.
 6. Rollover in steady turns.
 7. Yaw stability in steady turns.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Back tractor-semitrailer in straight line, curved paths, 45 degree angle, offset alley, and into a parallel park position.
- Use mirrors to check path and clearances while backing.
- Judge sides, rear, and overhead clearances and path of travel of the trailer.
- Selecting safe parking location, park and leave parking location safely.
- Select proper gear for speed and road conditions.
- Select the lane offering the best mobility and least traffic interference.

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- Keep vehicle centered in the lane of travel without drift or weaving.
- Adjust speed to the configuration and condition of roadway.

KNOWLEDGE OBJECTIVES

Driver must know:

- The procedures for backing and parking, lane positioning and merging.
- The correct position in which to place the vehicle before beginning backing or parking maneuver.
- The principles of reverse steering and articulated vehicles.
- The hazards of backing, the importance of avoiding unnecessary backing and the importance of checking the area prior to backing and of using a guide for assistance.
- How to select parking location having easy access and exit with MTCVs.
- The procedures for lane positioning, path selection and merging.
- How to minimize trailer drift and oscillatory sway while maintaining lane position or while merging.

SKILL OBJECTIVES

Driver must:

- Demonstrate coordination of speed and directional control to achieve the desired path while backing or parking.
- Demonstrate the ability to minimize trailer drift and oscillatory sway while maintaining lane position or while merging.
- Avoid cutting across lanes of travel to straighten out a curve.
- Coordinate steering input to prevent over or under steering.
- Adequately judge the path the trailers will take (off-tracking) as vehicle negotiates left or right curves and turns.

ATTITUDE OBJECTIVES

The driver must believe:

- That all backing is potentially dangerous, that the best way to avoid backing accidents is by avoiding the need to back.
- That all backing accidents can be avoided.
- That pull through parking spaces are the safest places to park MTCVs.
- Preplanning how you will exit is the first step to parking MTCVs.
- Proper lane positioning is absolutely essential to the safe operation of MTCVs.

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Major supporting concepts

- 0 Backing is the most difficult procedure to master. As a general rule backing with MTCVs is to be avoided. However, there are situations where backing may be unavoidable.
- 0 Driving MTCVs is complicated by the fact that a number of separate vehicles must be controlled -- a tractor or truck and, two or three trailers, each with separate handling characteristics. Further, there is a "train" of components to control -- a tractor or truck, a semitrailer, one or two converter dollies and two or three trailers -- connected together and controlled at two, three, four or five points of articulation.
- 0 A combination with two articulation points can be backed a considerable distance by a skilled driver, Included among these would be full trailers pulled behind straight trucks, B-train configurations, and twins or doubles with dual drawbars.
- 0 When there are more than two articulation points, combination units can seldom be controlled when backing more than a few feet.
- 0 While backing a full rig is to be avoided when possible, backing the tractor and one trailer is an essential procedure during the hooking maneuver. During the backing phase of hooking, all safety rules should be employed.
- 0 Special regulations for MTCV in some jurisdictions and on some roadways may restrict vehicle to travel in particular lanes.
- 0 Special attention in relation to position within lane is required when taking cruise speed curves and turns because of off-tracking tendencies of rearmost trailer. Check for drift on outboard side. There will be less drift if driver has set up the curve properly. Driver must brake or slow prior to curve and then accelerate gently or steadily through it. Proper position and speed reduces danger of slipping into other lanes.
- 0 Avoid cutting across lanes to straighten out a curve.
- 0 Centering the line of sight down the path the vehicle should travel, and steering toward the center of this selected path, will help to prevent over-steering and under-steering.
- 0 Even on a straight road a vehicle will not "hold the path" unless the driver is looking ahead, recognizing each movement away from the desired path, and making early (small) correction for each deviation.
- 0 Small steering movements or slight applications of the brakes, particularly in a lane change, are magnified by a second trailer.
- 0 Some states require combination commercial motor vehicles to operate in the rightmost lane of highways except when passing other vehicles. The power limitations of long combination trucks climbing steep grades also make it necessary for these vehicles to operate in the right lane so other vehicles may pass.

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- 0 Drivers have a responsibility to travel and make stops within a single lane of traffic. Certain factors can make this difficult (for the MTCV driver). Uneven road surfaces, worn tires, unmatched equipment, or crosswinds can cause the long truck to drift from its intended path. Also, the driver will need to check mirrors and gauges often without losing lane position.
- 0 If the driver looks away from the path of travel for any length of time, the vehicle will tend to lose lane position. Therefore, the driver must take quick glances to one mirror or gauge at a time. Of course, the driver should pick the best time to look away from the roadway to make these checks
- 0 Drivers must adjust their speed for curves in the road. If you take a curve too fast, the wheels can lose their traction creating a skid or they may keep their traction and the vehicle rolls over. Tests have shown that trailers with a high center of gravity can roll over at the posted speed limit for a curve.
- 0 Braking in a curve is dangerous because it is easier to lock up the wheels and cause a skid or jackknife. Slow to a safe speed before you enter a curve and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.
- 0 MTCV may disrupt traffic in freeway merge situations. If the unit is not able to gain enough speed within the acceleration lane to merge or find a gap long enough to safely merge , a problem is created. The vehicle may be forced to slow down or even stop, making it even more difficult to find a gap and enter the main flow of traffic.
- 0 Tractors with adequate horsepower must be dispatched for MTCV runs. They should be selected based on anticipated speeds, terrain and traffic conditions.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that illustrate each of the maneuvers to be performed. Also required are printed or visual materials that describe common hazards encountered by MTCV backing, parking, merging and the consequences of poor lane positioning and path selection.

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2.5 Turning, Steering and Tracking

Purpose

This unit provides instruction on turning situations, steering maneuvers and the tracking of MTCV trailers. This is to include instruction on trailer sway and off-tracking. Emphasis is placed on maintaining directional stability.

Outline of Suggested Content

➤ Turning the vehicle

A. Basic rules.

1. Speed.
2. Lane positioning.
 - a. Starting lane or position.
 - b. Ending lane or lane position.
3. Mirror checks.
4. Shifting.
5. Signalling.

B. Besides the radius of the curve and the weight of the vehicle; other road, vehicle and operator factors determine the safe speed for turning such as:

1. Off-tracking.
2. Coefficient of friction between tires and road.
3. Whether the road is flat, banked or crowned.
4. Condition of shock absorbers, springs, tires, and tire pressure.
5. Driver oversteering or understeering.
6. Braking in a curve (a very dangerous situation).
7. Center of gravity and type of load.
8. Vehicle configuration considerations, i.e. type dolly, etc.

➤ Positioning to turns

A. Positioning from single turn lane.

1. To single lane.
2. To multiple lanes.

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B. Positioning from multiple turn lanes.

1. to single lane.
2. to multiple lanes.
3. Hold lane position without drifting or weaving.

C. Accelerate gently / steadily in turn, pulling the trailers through the turn.

3 Steering

A. Driver control of four to six components comprising two to three vehicles (tractor/truck - semi/full trailer(s)) each having separate steering characteristics.

1. Tractor has oversteer tendencies.
2. Truck & trailers may have over or understeer tendencies depending on weight and load placement.

B. Smooth steering is critical.

C. Steer the tractor down the road, the trailers will follow.

D. Continuous small steering corrections to reduce trailer sway will, in reality, amplify trailer sway.

E. Minimize "steering input" during evasive maneuvers.

F. Role of steering control in:

1. Rollovers.
2. "Crack-the-whip" (rearward amplification).
3. Trailer sway.

➤ Trailer fidelity (tracking)

A. Definition.

B. Trailer sway.

1. FMCSR 393.70a "...three (3) inches either side of the path of the tow vehicle."

. 2. State requirements vary.

C. Causes of trailing infidelity:

1. Fifth wheels.
 - a. Properly mounted.
 - b. Jaws properly adjusted.
 - c. Properly lubricated.
2. Other vehicle components, i.e. tires, suspension, etc.

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3. Rough pavement.
4. Load distribution & center of gravity.
5. Driver inexperience.
6. Pintle hook snubbers.
7. Rapid steering movement (high speed).

➤ Off-tracking

- A. Definition.
- B. Swept path.
- C. Low speed off-tracking.
 1. Trailer tracks to the inside.
 2. As speed increases off-tracking decreases to zero.
- D. High speed off-tracking.
 1. Trailer tracks to the outside.
 2. Tire slip angles.
- E. Rearward amplification.

➤ Summary of safety concerns

- A. Condition and type of coupling devices.
- B. Condition of shock absorbers, springs, tires, tire pressure, etc.
- C. Braking in a curve.
- D. Pulling trailers versus having trailers push vehicle in a turn or curve.
- E. Examples of how directional instabilities can occur.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Position the vehicle for a turn and negotiate turns (left and right) of different degrees and ratios,
- Assume a safe speed prior to entering a turn and completing the turn at neither an excessive nor insufficient speed.
- Select and properly position in the turning lane offering the best mobility and least traffic interference, and complete the turn into the proper lane of travel.

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- Negotiate turns without trailer tires crossing demarcation line, touching curb or running off pavement edge.
- Minimize steering input in order to minimize trailer sway.
- Judge sides, rear, and overhead clearances and path of travel of the trailers.
- Observe the rear of the trailer, through the appropriate mirror, while turning.

KNOWLEDGE OBJECTIVES

Driver must know:

- The proper position from which to begin a turn and how to “set up”, execute and recover from a turn.
- The steering characteristics of tractors and trailers and what the driver can do to control rearward amplification.
- The procedures for carrying out the performance objectives.
- How to control trailer drift and oscillatory sway while turning.
- The factors which determine the safe speed for a turn.
- The proper lane to proceed from and to end in when making turns (left and right) from single and multiple lane into single and multiple lanes.
- The basic principle of trailer tracking & off-tracking.
- The differences between low and high speed off-tracking.
- The basic causes of trailer off-tracking and the procedures for minimizing the effect of off-tracking.
- The relationship of wheel base length, articulation, and number of axles to path of a turn.

SKILL OBJECTIVES

Driver must:

- Adequately judge the path the trailers will take (off-tracking) as vehicle negotiates left or right curves and turns.
- Demonstrate coordination of speed and directional control to achieve the desired path of travel.
- Demonstrate the ability to control trailer drift and oscillatory sway while maintaining lane position while turning.
- Coordinate steering input to prevent over or understeering.

ATTITUDE OBJECTIVES

The driver must believe:

- That proper lane positioning is absolutely essential to safe MTCV operation.

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- That smooth steering is critical to maximum trailer stability when maneuvering MTCV.
- That the best way to minimize the effect of evasive maneuvers (to vehicle stability) is to recognize the situation and begin evasive steering as soon as possible. Early recognition can reduce the severity of the maneuver.

Maior supporting concepts

- The driver must be able to position the tractor and trailers appropriately in initiating and completing a turn so as to prevent other vehicles from passing on the wrong side and to minimize encroachment on other lanes.
- The right turn is considered the more critical maneuver because' with the inward tracking of the rear wheels at low speeds, the truck has a greater probability of "cutting" the curb or conflicting with oncoming traffic.
- Drivers must give special attention to at least four turning situations where vehicle position adjustment may be required:
 - Left turns: Avoid encroaching upon opposite lanes; avoid swing right first (this gives wrong impression of intentions); being alert to paths of other vehicles and turning points.
 - Wide right turns: Performed when turning into street that is wide enough to handle large turning radius. Driver must be both attentive to requirements and able to skillfully execute them.
 - Tight right turns: Driver must know the what, where and how requirements.
 - Turning alongside: When two or more lanes are provided for turning traffic, the driver should use the outside lane.
- Besides the radius of the curve and the weight of the vehicle; other road, vehicle and operator factors determine the safe speed for turning such as:
 - Off-tracking. When a vehicle is cornering' the front wheels lead the rear wheels in such a manner that the tracks of the rear wheels are inside those left by the front wheels.
 - Coefficient of friction between tires and road. The coefficient of friction between the tires and the road surface is the most significant factor in determining the safe speed on a curve.
 - Whether the road is flat, banked or crowned. Whether the road is banked, flat or crowned make a considerable differences in the safe speeds for negotiating a curve. (Crowned roads are banked the wrong way for a left hand turn).
 - Condition of shock absorbers and springs. Properly functioning shock absorbers and springs increase cornering ability as they work with friction and gravity to combat centrifugal force.
 - Condition of tires, and tire pressure. Proper tire pressure is important for optimum vehicle performance on a curve. Cornering ability tends to

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improve with the increase of pressure at a constant load, because of the increase in sidewall stiffness.

- Driver oversteering or understeering. Oversteering on a turn generally results from accelerating too soon or failing to return the steering wheel to straight ahead soon enough. Understeering generally results from entering a curve too fast for the conditions.
- Braking in a curve (a very dangerous situation). Braking the vehicle after entering the curve will tend to play into the hands of inertia and cause the vehicle to plow straight ahead on a tangent to the curve.
- Center of gravity and type of load. The dimensions and weight distribution of a vehicle have a lot to do with its cornering stability and the ease with which it can be handled on turns and curves.
- Vehicle configuration considerations, i.e. type dolly, etc. In determining the safe speed for curves, engineers have considered vehicle and driver capabilities and also the physical forces involved at the time the road was built. The posted speed limit is most generally established with automobiles in mind. A driver has to be careful in assessing what is the safe speed for his / her vehicle to safely maneuver through a particular turn.
- There are several types of instability related to steering maneuvers. These include pure rollover, "rear end amplification" of the **rearmost** trailer in a unit ("cracking the whip") as a result of rapid steering maneuver, and trailer sway during straight ahead operation.
- The driver should minimize the amount of steering and turning during evasive maneuvers. This can be done by starting the evasive steering as early as possible. Start as soon as an emergency is recognized. The earlier the driver starts, the smaller the amount of turn that is necessary. Turn only as much as needed. The larger the turn, the greater the chance of a rollover or jackknife.
- When driving doubles, the driver is controlling four components, a tractor, a dolly and two trailers. With triples there are five components. Each of these units can have separate steering characteristics. The tractor generally has oversteering tendencies, and the trailer / dolly combination units may have oversteering or understeering characteristics depending on the type load and weight distribution.
- Numerous explanations have been given for the sway of the rear trailers in **MTCVs**, these include:
 - Rough pavement.
 - Slack pintle hook.
 - Dry fifth wheels.
 - Mixed axle width's.
 - Mixed dollies.

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- Driver inexperience.
- Rapid steering movement at high speed.
- Loading and mechanical and environmental factors can also affect trailer sway and overall stability.
 - Uneven load distribution on individual axles or among trailers, particularly a last trailer that is empty or lightly loaded, can add to instability. Loads with higher centers of gravity can also decrease stability.
 - Mechanical factors, including poorly lubricated fifth wheels, which are connection mechanisms between the tractor and the first trailer and between the converter dolly and additional trailer(s), and loose-fitting pintle hooks (connections at the lead trailer) can increase instability.
 - Trailer sway can result from a fifth wheel that is poorly mounted or loosely fitted, or one that is dirty or poorly lubricated. The driver must be sure that *all* fifth wheel plates have a sufficient layer of lubrication. Lack of lubrication can cause the rear trailer to wander on the highway, even with no movement of the steering wheel.
 - The pintle hook is another device that can affect trailer sway. Properly adjusted pintle hook snubbers are required to eliminate slack in the latching mechanism that causes swaying of trailers.
 - Environmental factors such as gusting winds or rutted highways can contribute to further problems. Rutted highways are of particular concern if axle widths of the converter dollies are narrower than those on the rear trailers. This arrangement can cause additional trailer sway because the narrower wheels of the converter dollies (96 inches) try to climb into the ruts, while the wider wheels on the rear trailers (102 inches) try to climb out.
- Federal regulations (49 CFR 393.70a) require that when two or more trailers are operated in combination and when the combination is operated in a straight line on a level, smooth, paved surface, the path of the towed vehicle will not deviate more than three (3) inches to either side of the path of the vehicle that tows it.
- State requirements vary and may be more restrictive than the FMCSRs.
- Public perception of independent vertical movement of MTCV trailers (due to pavement, ruts, potholes etc.) is often misconstrued to be trailer sway.
- In the mirrors, a driver may notice some movement in the second trailer. It is not necessary to make steering corrections to counter the movements. Suggesting that "continuous small steering corrections" are necessary (to correct trailer sway) is exactly opposite of what MTCV drivers should be trained to do. Continuous corrections create trailer sway. The driver should concentrate on steering the tractor and the trailers will follow.
- The ability of trailers to precisely follow the tractor is referred to as "trailing fidelity".

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- The trailing fidelity of combinations is often less desirable because of :
 - Low- speed off-tracking.
 - High speed off-tracking.
 - Rearward amplification.
- Off-tracking is defined as the additional width (over and above vehicle width) that is required to make a turn. When **LCVs** make turns, the tires of the **rearmost** trailer do not follow the path of the front tires of the tractor. The resulting "sweep path" may exceed the space available in the lane of travel. At lower speeds, additional space is required toward the inside of the curve, but as speeds increase, additional space is needed toward the outside of the curve. At slow speeds, the rear trailer's tires can strike roadside objects, **overrun** curbs, or encroach into adjacent lanes, particularly when multiple-trailer trucks turn at intersections. At higher speeds, the rear trailers tires can cross center lines and encroach into adjacent traffic lanes or **overrun** a ramp's outside curb, which can cause trailer(s) to roll over.
- Off-tracking occurs when successive axles on a vehicle follow different paths as a vehicle turns. The distance between the path of the tractor's front axle and the path of the **rearmost** trailer axle as the vehicle negotiates a particular turn is the amount of off-tracking for that turn. If the axle paths deviate from one another too much, the vehicle can not stay within its proper lane. Either the front of the vehicle must swing into opposing lanes of traffic, or else the rear wheels must run off the roadway or onto adjacent lanes to make the turn.
- All vehicles off-track to a certain extent at low speeds, but in general, the longer the vehicle and the fewer the number of articulation points, the greater the off-tracking.
- **Low-speed off-tracking:**
 - Tracking Infidelity: When combination vehicles turn at intersections at low speed, the wheels of the **rearmost** axle follow a path to the inside of the part of the frontmost axle. This tracking infidelity at low speed, or low-speed off-tracking, increases with increased distance from the kingpin to the center of the rear axle. When low-speed off-tracking exceeds available road space at intersections, the turning trucks may encroach on adjacent traffic lanes, the rear wheels may fall off the pavement, or the trucks may sideswipe roadside objects.
 - Low-speed off-tracking occurs when each axle of the vehicle follows a path which lies inside of that inscribed by the preceding axle. *As combination vehicles travel around a curved path at increasing speed, low speed off-tracking decreases and actually becomes zero.*
 - When traveling at low speed, all vehicles (which use steering front axle and non-steering rear axles) exhibit inboard off-tracking in low-speed cornering. This is true of cars, single-unit trucks and combination vehicles. Recognizing that, at low speed, each tire travels forward in just the direction it is pointed, it is straightforward to show that each axle of

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the vehicle subtends a curved path whose radius is smaller than the radius of the path of the preceding axle.

- The extent to which a commercial vehicle will off-track at low speed is strongly related to its length, or wheelbase. Off-tracking is reduced by the addition of articulation joints.
- The configuration of an LCV greatly affects off-tracking. Triples, because of their trailer's shorter wheelbases and increased number of points of articulation, generally exhibit low-speed off-tracking similar to or even less than that of truck tractors with a single 45-foot trailer depending on the severity of the curve. In contrast, turnpike doubles using trailers with longer wheelbases and having fewer points of articulation, exhibit increased low-speed off-tracking nearly twice that of triples. Low-speed off-tracking by Rocky Mountain doubles is between these two extremes.
- Low-speed off-tracking of combination vehicles does not depend on gross vehicle weight.
- The slope of the road surface will accentuate low speed off-tracking in the direction of the slope.
- Generally, low-speed off-tracking, which occurs when the trailing axles of a vehicle migrate toward the center of a curve, is greatest for turnpike doubles, followed by Rocky Mountain doubles, conventional tractor-semitrailers, and triples. Triples have the best low-speed maneuverability because of their short trailer wheelbases. The greater the off-tracking, the wider the road needs to be to accommodate turns.
- **High-speed off-tracking:**
 - At high speeds, the trailer tracks to the outside of the path of the tractor. High-speed off-tracking occurs when the wheels of the rearmost axle track outside the path of the front most axle. High-speed off-tracking is influenced by the wheelbase dimension, axle loads, number of articulation points, and tire properties. This phenomenon, which occurs mostly on interchange ramps and highway curves where high speeds are possible. This type of off-tracking is small, ranging from about one-half foot for a tractor-semitrailer to about two feet for triples (three 28 footers) on a 600 foot radius curve taken at 55 mph.
 - When cornering at speed, each tire does *not* travel in precisely the direction it is pointed. Rather, in order to develop the necessary cornering forces, each tire operates at some slip angle. The level of slip angle at each tire depends on tire properties, tire loading, and the severity of the maneuver (i.e., the level of required cornering force at that tire). When slip angles are large enough, rear axles may off-track outboard of the front axles of the vehicle.
 - High-speed off-tracking is essentially composed of inboard, low-speed off-tracking plus the outboard off-tracking induced by slip angle. The latter, outboard component is large at higher speed for longer vehicles

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with lower cornering stiffness tires. Some vehicle properties (such as more articulation) joints) which lessen low-speed, inboard off-tracking, aggravate outboard, high-speed off-tracking.

- Factors such as shorter wheelbases on trailers and **more** points of articulation decrease low-speed off-tracking but increase high-speed off-tracking. Consequently, test results show that at 55 miles per hour (mph) on the same curve, trucks with single-trailers off-track about six inches, turnpike doubles slightly **over** one foot, Rocky Mountain doubles one and one-third foot, and triples slightly over two feet.
- When combination vehicles turn at high speed, the wheels of the **rearmost** axle track outside the path of the frontmost axle, a condition known as high-speed off-tracking. High-speed off-tracking is influenced by the wheelbase dimension, axle loads, number of articulation points, and tire properties.
- Other things being equal, high-speed off-tracking for existing tractor-semitrailers and MTCVs increases with gross weight.
- **Swept path:** The significance of **low** speed off-tracking becomes **more** obvious when it is expressed in terms of the "maximum swept path" of the vehicle. The maximum swept path is equal to the sum of the off-tracking plus the vehicle width. If the swept path exceeds the lane width, a vehicle must leave its lane to negotiate a turn.

This chart shows the maximum off-tracking and the maximum swept path of various 102 inch wide combinations on a 300 foot radius curve:

Vehicle	Off-tracking	Maximum Swept Path
Turnpike Double 48/48	5.6 feet	14.1 feet
Turnpike Double 45/45	4.9 feet	13.4 feet
Rocky Mountain Double 48/28	3.8 feet	12.3 feet
Rocky Mountain Double 45/28	3.4 feet	11.9 feet
Tractor - Semi 48 ft trailer	3.2 feet	11.7 feet
Triple - 28 ft. trailers	2.9 feet	11.4 feet
Twin - 28 ft. trailers	2.0 feet	10.5 feet

MATERIALS

Classroom instruction must be supported by dynamic visuals **or** sequential static visuals that illustrate each of the maneuvers to be performed. Also required are printed **or** visual materials that describe **common** hazards encountered by MTCVs while turning and maneuvering. This should include information on the **consequences** of poor lane positioning and trailer tracking.

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2.6 Proficiency Development: Basic Operations

Purpose

The purpose of this unit is to enable drivers (trainees) to gain the proficiency in basic operation needed to safely undertake on-street instruction in the Safe Operations Practices section of the curriculum.

The activities of this unit consist of driving range (yard) exercises that provide practice for the development of basic control skills and mastery of basic maneuvers. Trainees practice skills and maneuvers learned in Units 2.3, 2.4, and 2.5. A series of basic exercises are practiced on the range until trainees develop sufficient proficiency to transition to on-street driving.

Only after the student's skills have been measured and found to be adequate will the student be allowed to transition to on street driving.

Nearly all activity in this unit will take place on the range or under low-density traffic conditions. There is a brief classroom session to familiarize trainees with the exercises they will perform on the range and how their performance will be rated.

Outline of Suggested Content

➤ Introduction to proficiency development exercises (Classroom)

A. Description and purpose of range exercises.

1. Basic control skills.
2. Basic maneuvers (pre-street driving).

B. Procedures and practice routines.

1. Basic control skills.
2. Basic maneuvers (pre-street driving).

C. Standards for performance evaluation.

1. Basic control skills.
2. Basic maneuvers (pre-street driving).

D. Safety rules for range exercises.

➤ Proficiency development: Basic control (range) Instructor demonstration.

A. Practice exercises.

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1. Coupling & Uncoupling
2. Backing -- Straight line (single trailer unit).
 - a. Backing - Parallel park (single trailer unit).
 - b. Backing - Jackknife park (single trailer unit).
 - c. Coupling
 - d. Uncoupling
3. Turnabout.
4. Forward stop.
5. Forward serpentine.
6. Offset alley.
7. Tight circles -- left and right.

➤ **Skill attainment evaluation.**

1. Performance testing for basic control skills.
2. Identification of remedial **or** additional practice needed to meet standards **and/or** unit objectives for each vehicle configuration.

➤ **Proficiency development: Basic maneuvers (pre-street)
Instructor demonstration.**

- A. Practice exercises.
(range **or** low-density traffic conditions).
 1. Starting, upshifting, **downshifting** and stopping.
 2. Lane - keeping / straight.
 3. Lane - keeping / curve.
 4. Lane - keeping / turn.
 5. Right turns.
 6. Left turns.
 7. Curves.

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➤ Practice basic skills and maneuvers: On-street (Legally permitted routes with limited amount of traffic)

A. Roadway exercises:

1. Starting, upshifting, downshifting and stopping.
2. Left and right turns.
3. Lane - keeping.
4. Lane changes.
5. Negotiating curves.
6. Situations:
 - a. Straight without significant curves,
 - b. Straight with significant curves.
 - c. Controlled and uncontrolled interchanges.
 - d. Freeway interchanges.
 - e. Hills and grades.

➤ Skill attainment evaluation

- Trainee performance is evaluated against a prescribed criteria, including these basic control factors:
 1. **Acceleration:** Smooth acceleration; no jerky, abrupt acceleration from a standing start and when increasing speed.
 2. **Braking:** Smooth, controlled stops, no rebound of front end or sound of exhausting air.
 3. **Stopping point:** Comes to a complete stop within 3 feet of stopping point or within sufficient distance from the vehicle ahead,
 4. **Upshifting:** Shifts through all gears without hesitation. Does not miss or skip a gear causing lurching / lugging (failure to shift soon enough). Shifts smoothly at proper RPM without jerking the vehicle. Double clutches all shifts with a minimum of grinding.
 5. **Downshifting:** The gear selected is suitable to the road speed of the vehicle driven. Shifts smoothly without hesitation and minimal grinding of the gears. Double clutches all shifts.
 6. **Uphill Operation:** The gear selected is suitable to the road speed and gradeability of the engine. Driver shifts smoothly without hesitation and minimal grinding. Double clutches all shifts.

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7. **Starting On An Incline:** Driver pulls away from the stop smoothly. Engine remains running. Vehicle does not roll back. Driver properly coordinates the parking brake, foot brake, and throttle resulting in the vehicle pulling away smoothly.
8. **Downhill Operation:** Driver starts down the hill in the proper gear and uses the appropriate braking technique for the decline. Speed does not **exceed** the posted speed limit.
9. **Speed Adjustment - Curves:** Driver adjust speed prior to entering curve and maintains appropriate speed throughout curve. Driver does not shift or brake in the curve.
10. **Lane-Keeping - Straight:** Driver maintains lane position in path of travel without touching or crossing lane markings.
11. **Lane-Keeping - Curve:** Driver maintains lane position in path of travel without wandering back and forth between lines or touching or crossing lane markings.
12. **Lane-Keeping - Turn:** Driver operates vehicle within the designated lane without crossing lane demarcation lines or running off pavement edge, unless vehicle length and street width necessitates encroachment.
 - a. **Right Turn:** Driver negotiates right turn without trailer tires crossing lane demarcation line, touching curb or running off pavement edge, unless vehicle length and street width requires it.
 - b. **Left Turn:** Driver negotiates left hand turn without cutting **across** the top of the turn (crossing the center line of the street he/she is entering), unless vehicle length and street width requires it.
13. **Curves:** Driver holds lane position without drifting or weaving. Trailer wheels are kept within lane markings and driver steers appropriately to the far left or right to compensate for the off-tracking of the trailers.
14. **Signaling:** Driver activates appropriate signal before performing maneuver. Driver cancels signal before upshifting or within 5 seconds of accomplishing maneuver.
15. **Mirror Checks:** Driver makes regular checks (approximately every ten seconds) of his / her mirrors to be aware of traffic and to check condition of vehicle.
16. **Mirror Checks - Turns:** Driver checks position of trailer with appropriate mirror or by looking over his / her shoulder when the rear of the trailer reaches the top of the turn.
17. **Mirror Checks - Lane Change:** Driver checks appropriate mirror before initiating lane change. Driver maintains lane position while checking appropriate mirror.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to **perform** the **following** to the level of **proficiency** required to permit safe entry into **on-street instruction**:

- Maneuvering through sharp turns (e.g., offset or alley).
- Maneuvering through a series of sharp turns (e.g., forward serpentine).
- Maneuvering into areas restricted to the rear, sides, and front.
- Judging the position of the right wheels.
- Judging clearances at the rear, front and sides.
- Maintaining proper vehicle and engine speed on upgrades and downgrades.

KNOWLEDGE OBJECTIVES

Driver must know:

- No new objectives.

SKILL OBJECTIVES

Driver must:

- Coordinate acceleration and braking to maneuver the vehicle with a high level of proficiency.
- Coordinate clutch, throttle and gear shift to maintain engine at proper speed when shifting on upgrades and downgrades.

ATTITUDE OBJECTIVES

The driver must believe:

- No new objectives.

Major supporting concepts

- The purpose of range exercises is to further develop driver skills (taught in previous units) in basic vehicle control and operation by providing instruction and supervised practice in:
 - Timing and coordination in manipulation of vehicle controls (e.g. steering wheel, accelerator, and brake pedal).
 - Safe and efficient techniques for performing such maneuvers as:
 - a. Coupling and uncoupling
 - b. Turning about in tight spaces
 - c. Negotiating offset alleys

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- d. Weaving around obstacles in path
- e. Controlled stops
- 0 Range practice should continue until drivers (trainees) have attained enough vehicle handling judgment and skills to safely engage in street **or** on-road training lessons.
- 0 Basic control skills and maneuvers tests are used as an objective measuring device to determine when trainees have attained a sufficient degree of knowledge, skill and judgment of vehicle spatial requirements and self confidence necessary to **commence** the basic street **or** on-road training.
- 0 Trainees should be provided practice in basic vehicle operation on the range **or** in low density traffic conditions before going on to **more** difficult on-road practice.
- 0 In this unit, to allow trainees to concentrate their attention upon vehicle handling, instructors should provide assistance to the trainees by:
 - o Reminding them to shift gears when necessary
 - o Reminding them to signal and cancel signals
 - o Warning them as to potential hazards, excessive speed, insufficient clearance and safety margins
 - o Directing them around areas **of** congestion, low overhead **or** lateral clearance, reversible traffic lanes, and potential hazards
- 0 The driver communicates with his / her vehicle and the roadway through the steering control, accelerator and braking control.
- 0 To drive the vehicle in situations requiring sharp turning movements (particularly in tight quarters), on hills and in other situations requiring precise movements. MTCV drivers need to coordinate the use of vehicle controls and make skilled and properly timed actions based on sound judgments and decisions. Techniques and underlying concepts required for developing smoothness and precision in these maneuvers is an important part of the driver training curriculum.

MATERIALS

On range and on street instruction must be supported by materials **or** equipment that permit instructor and observer critique, such as an observer checklist and:

- o Rules for range exercises
- o Rules for on-street driving
- o Range diagrams for exercises
- o Driver performance scoring criteria checklist **or** scoring forms

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UNIT 2.6 DRIVER RULES FOR RANGE EXERCISES

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow all range exercise procedures exactly. If you do not understand an instruction or exercise, ask for help before proceeding.
- D. Only one vehicle may be operated within an exercise layout.
- E. In the case of any malfunction, emergency, or problem, stop and alert an instructor.
- F. Always check on all sides of the vehicle before moving.
- G. When you are observing other trainees' driving, stay well back from the moving vehicles. Do not stand close to a moving truck and never where the driver cannot see you.
- H. Maintain a safe distance between your vehicle and others.
- I. No trainee may drive after drinking any alcoholic beverage nor when taking drugs or other medication that may affect their ability to drive safely.

UNIT 2.6 DRIVER RULES FOR ON-STREET DRIVING

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow all instructions given by the driving instructor. If you do not understand an instruction, ask for clarification before proceeding.
- D. Alert the driving instructor to any malfunction or potential malfunctions indicated by gauges, warning lights, etc.
- E. Obey all traffic laws.
- F. Carry your driver's license or learner's permit, medical certificate, and logbook at all times.
- G. No trainee may drive after drinking any alcoholic beverage or when he/she is taking prescribed drugs or other medication that may affect his / her ability to drive safely.
- H. Check your path carefully before moving.
- I. Trainees in the vehicle who are not driving, must be observing the driver and the road ahead. They may not carry on conversations that will distract the driver.

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SECTION 3 - Safe Operating Practices

The units in this section cover the interaction between student drivers, the vehicle, and the traffic environment. They are intended to teach driver trainees how to apply their basic operating skills in a way that ensures their safety and that of other road users under various road, weather and traffic conditions.

Five units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
3.1	Interacting With Traffic	2			2	4
3.2	Speed & Space Management	2			4	6
3.3	Night Operations	1.25	1	1	2	5.25
3.4	Extreme Driving Conditions	2	2			4
3.5	Proficiency Development	0.75			24	24.75
TOTAL		8	3	1	32	44

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3.1 Interacting With Traffic

Purpose

This unit provides instruction on the principles of visual search, communication and sharing the road with other traffic. Emphasis is placed on visual search, mirror usage, signaling and/or positioning the vehicle to communicate and understanding the special situations encountered by MTCVs in various traffic situations.

Outline of Suggested Content

➤ Introduction to sharing the road with other traffic.

- A. As others see MTCVs.
- B. MTCV trailers can be intimidating to other road users.
- C. Professional drivers must compensate for the lack of understanding of others with whom they share the road.
- D. MTCVs in the traffic stream can influence others sharing the road.
- E. MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.

➤ Visual search techniques

- A. Looking ahead
 - 1. Importance of looking far enough ahead.
 - 2. How far and how often to look ahead.
 - 3. What to look for in traffic and road conditions.
- B. Mirror usage
 - 1. Importance of clean and properly adjusted mirrors.
 - 2. Incorporating mirror adjustment in vehicle inspection procedures.
 - 3. Know the characteristics of various mirrors used.
 - a. Fields of vision.
 - b. Location and extent of blind spots.
 - c. How to read speed and distance of overtaking vehicles.
 - d. How to account for distortion of convex mirrors.
 - e. Amount of distortion and overlap between plane or flat and convex mirrors when used in combination.

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4. What to look for in your mirrors.
 - a. Traffic on either side and in back **of** the vehicle.
 - b. Check your vehicle and the tracking of the trailers behind the tractor.
5. Incorporate mirrors in visual search techniques.
 - a. Check mirrors quickly and frequently, looking back and forth between the mirrors and the road ahead.
 - b. Increase mirror usage during maneuvers such as lane changes, turns, merges and heavy traffic.
 - c. Be aware of blind spots and use your mirrors to compensate. Other traffic has to move into a blind spot. Proper visual search will reduce the probability of **someone** entering your blind spots unnoticed.
6. Vision problem areas around vehicle.
 - a. Area in front of hood.
 - b. Passenger side of truck - forward of fuel tank.
 - c. Driver side of truck - rearward of fuel tank.
 - d. Rear of truck **or** back **of** trailers.
 - e. During 90 degree right turn **rearmost** trailer will be lost in the mirrors.
7. Vision problems due to environmental conditions.
 - a. Bright sunlight **or** glare.
 - b. Rain, sleet, **snow or** dust storm.
 - c. Fog, low clouds in mountains **or** smoke from any source.
 - d. Darkness, dawn **or** dusk.

➤ Communications

- A. Signal to communicate what you intend to do in turns, lane changes, slowing down and preparing to stop.
- B. Use of brake light to communicate presence **or** intentions.
- C. Use of four-way flashers to communicate presence **or** intentions.
- D. Use of headlights to communicate presence **or** intentions.
- E. Use of horn to communicate presence **or** intentions.
- F. The way the vehicle is positioned can assist in communicating your intentions **or** confuse other traffic.
- G. Certain situations such as hazards, severe road conditions, weather conditions (rain, sleet, snow, fog, dust storm, low clouds in the mountains) **or** whenever it is difficult to see (night, dawn, dusk, or smoke) requires special effort to communicate presence and intentions.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Adjust road speed and space around vehicle to accommodate other traffic.
- 0 Clean and properly adjust both flat and convex mirrors on the vehicle.
- 0 Change or adjust mirror settings for trailers of different widths.
- 0 Maintain a minimum 12 second visual search lead time.
- 0 Scan both sides of the road using quick glances and describe roadside and or adjacent vehicle activity.
- 0 Include appropriate instrument panel checks in the visual search pattern.
- 0 Adjust visual search pattern during maneuvers such as lane changes, turns and merges.
- 0 Measure speed and distance of overtaking vehicles.
- 0 Monitor traffic entering and exiting the vehicle's blind spots.
- 0 Monitor trailers and identify signs of vehicle problems.
- 0 Adjust speed and space around vehicle for vision impairment due to environmental conditions.

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 How to compensate for the lack of understanding of others with whom we share the road.
- 0 That other motorists are used to seeing only one trailer and that this perception could cause a hazardous situation.
- 0 That the presence of MTCVs in the traffic stream influences the operation of other vehicles.
- 0 The effects of having additional points of articulation.
- 0 How to control rear trailer sway or amplification.
- 0 The proper adjustments of the various types of mirrors.
- 0 The difference in images presented by flat and convex mirrors.
- 0 Appropriate visual search techniques for various road, traffic and maneuvering conditions.
- 0 The relationship between speed and sight distance.
- 0 The location and extent of blind spots on his / her vehicle.
- 0 That truck blind spots are a safety concern that can only be reduced through incorporating appropriate mirror usage into visual search techniques.

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- When to actuate turn signals to provide adequate warning without creating confusion.
- State traffic laws for turn signals.
- The importance of signalling for the prevention of accidents.
- That not giving appropriate signals could lead to an accident.
- The conditions under which other drivers may give false signals.
- The appropriate use of the horn is to give warning to others of your presence only when needed.

ATTITUDE OBJECTIVES

The driver must believe that:

- Obeying traffic laws is important and will reduce the risks of having an accident.
- Courtesy on the highway is important and is a good safety principle to follow.
- The perception of how others see professional drivers handling themselves and their vehicles is very important.
- A professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.
- Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- It is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- A professional driver is always in control of his / her vehicle and his / her emotions.
- Emotional instability can contribute to unsafe acts.
- MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.
- The ability to respond to changing road conditions requires proper visual search techniques.
- The first sign of trouble is often identified by the driver when checking his / her mirrors.
- Development of good visual search habits is essential to safe driving and will reduce driver fatigue.
- Signaling one's intentions is essential to avoiding accidents.
- Improper use of the horn, signals, and the cb is potentially dangerous and will tarnish the image of the professional driver.

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Major supporting concepts

- 0 The professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be as he/she shares the road with other roadway users.
- 0 Most highway users are unaware of the limitations and longer space requirements of MTCVs. The longer, wider tractor trailers are more difficult to see around and require longer distances to pass them.
- 0 Other motorists are used to seeing only one trailer behind the tractor. In some cases they may assume the truck is past and move into the second or third trailer.
- 0 The presence of MTCV trailers in the traffic stream influences the operation of other vehicles due to sight distance, speed and space requirements for passing.
- 0 Errors on the part of one operator can be compensated for by mature judgement and skill on the part of another driver in almost every situation.
- 0 Before and while driving, checking yourself out is as important as the pre trip inspection. Taking along any emotional baggage, i.e. personal problems, can lead to lack of concentration on driving, poor judgement and slow reaction to dangerous situations.
- 0 A safe driver always knows what's going on all around his / her vehicle. Use visual search techniques to get the big picture at least 12 to 15 seconds out from the vehicle. Keep your eyes moving scanning the horizon, looking back and forth between your mirrors and the road.
- 0 Include the instrument panel in your visual search to make sure your vehicle is operating properly and your speed is consistent with road, weather and traffic conditions.
- 0 Proper mirror adjustment is essential to seeing to the sides and rear of the vehicle. This procedure should be included in the pre-trip inspection. Correct mirror adjustment allows for maximum visibility from the drivers position with minimum movement of the drivers head.
- 0 Most tractors are equipped with two kinds of mirrors, plane and convex. The convex mirrors show a wider area than the plane or flat mirror, but they make everything look smaller and farther away than they actually are.
- 0 Convex mirrors must be adjusted to show the areas that the plane or flat mirrors do not show. Convex mirrors should never be used to judge speed or distance of objects.
- 0 The plane or flat mirror should be used to see what is going on behind and to the side of the vehicle and to judge the distance and the speed of approaching vehicles.

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- 0 The convex mirror is useful when checking for vehicles on entrance or exit ramps, when passing, and when making right turns. They are also helpful in partially eliminating blind spots on the sides of the vehicle. The other traffic has to move into a blind spot. Proper visual search will reduce the probability of someone entering your blind spots unnoticed.
- 0 A driver's first clue of a vehicle problem, trailer sway, off-tracking, tire failure, fire, etc., is usually via the rear view mirror. He/she should check mirrors quickly and frequently, looking back and forth between the mirrors and the road ahead.
- 0 A professional driver should increase mirror usage during maneuvers such as lane changes, turns, merges and heavy traffic.
- 0 During a 90 degree right turn with **MTCVs**, the **rearmost** trailer will be lost in the mirrors. Driver must look out of the window to monitor the trailer's path.
- 0 Signalling what you intend to do is often the only way other drivers can know what you are going to do.
- 0 When making a turn (left or right) signal early well before you turn, signal continuously throughout the turn, and don't forget to cancel the turn signal after the completion of the turn.
- 0 When making a lane change put your turn signal on early, well in advance, to allow other motorists the opportunity to adjust for your maneuver or identify themselves to you if they are in a blind spot.
- 0 Use the four-way emergency flasher to communicate your presence when your are going very slow due to road conditions, weather conditions, a hazard ahead or are stopped.
- 0 When you are in the process of stopping for a hazard, railroad crossing, etc., warn other drivers by flashing your brake lights.
- 0 Use your horn only when it is necessary to identify your presence to another vehicle. Be aware that the sound of your horn could startle the other driver and could be dangerous. When faced with an emergency reaction state such as a vehicle suddenly encroaching in your path of travel, it is sometimes safer to allow the other vehicle to continue on its course or path of travel rather than risk a sudden braking on the part of the other startled person driving the vehicle.

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on how professional drivers interact with other traffic.

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3.2 Speed and Space Management

Purpose

This unit provides instruction on the principles of speed and space management. Emphasis is placed on maintaining safe vehicular speed and appropriate space surrounding the vehicle under various traffic and road conditions. Special attention is placed on understanding the special situations encountered by MTCVs in various traffic situations.

Outline of Suggested Content

➤ **Speed management**

- A. The importance of Speed management.
- B. Speed and stopping distance.
 - 1. Perception distance.
 - 2. Reaction distance.
 - 3. Braking distance.
- C. Vehicle weight and stopping distance.
 - 1. Total vehicle weight and traction.
 - 2. Weight distribution in each trailer.
 - 3. One or more empty trailers.
- D. Vehicle configuration, speed and shape of the road.
 - 1. Wind resistance and cross winds.
 - 2. Effect of gap between trailers and wind resistance.
 - 3. Road curves, grades, crowns*
 - 4. Lane widths, narrow bridges, and soft shoulders.
- E. Matching speed to road surface conditions.
 - 1. Traction and road surface friction,
 - 2. Slippery and icy road conditions,
 - 3. Hydroplaning, black ice.
 - 4. Shaded areas and bridge freeze first.

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F. Speed and sight distance.

1. Sight distance and 12 to 15 second rule.
2. Effect of speed on field of vision.

G. MTCVs in the traffic flow.

1. How MTCVs influence the traffic flow.
2. Speed Management in traffic.
3. Speed Management in merging situations.

H. Speed limits and speed management.

1. Speed limit may be too fast.
2. Problems encountered when safe is slower than the speed limit.

I. Effect of speeding on equipment and driver.

1. Accelerated deterioration of equipment.
2. Increased breakdowns.
3. Increased cost of operation per mile.
4. Driver fatigue and decreased response to road, hazards and environment.

➤ **Space management**

A. The importance of Space management

B. Space cushion around vehicle.

C. Space to the sides.

1. Positioning vehicle properly on road surface.
2. Adjusting within lane for various road conditions.
3. Positioning vehicle properly for various maneuvers.
 - a. Curves.
 - b. Exit & entrance ramps.
 - c. Lane changes.
 - d. Turns.

D. Space ahead of vehicle.

1. Following distance rule.
2. Affect on space behind vs. ahead.
3. Legal requirements for following distance.

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- E. Space behind vehicle.
 - 1. Adjust for blind spot.
 - 2. How to deal with tailgaters safely.
- F. Space above and below the vehicle.
 - 1. Overhead abutments, bridges, wires. etc.
 - 2. Road hazards and debris.
 - 3. Elevated railroad crossings and driveways.
- G. Traffic gaps and merging situations.
 - 1. Definition of gap in traffic.
 - 2. Space and speed requirements when:
 - a. Crossing and entering traffic.
 - b. Passing.
 - c. Merging.
 - d. Railroad crossings.
 - 3. Alignment with traffic when merging.
 - 4. Six point procedure for merging into gaps.
 - a. Look for gap.
 - b. Signal for gap.
 - c. Aligning.
 - d. Find, locate or select gap.
 - e. Adjust speed.
 - f. Enter gap.
- H. Giving space to others.
 - 1. Principles of right of way.
 - 2. Avoid hindering traffic.
 - 3. Adjust following distance to produce gap for others.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Judge the maximum safe speed at which a curve can be entered.
- 0 Judge the maximum safe speed that traction will permit.
- 0 Judge the maximum safe speed at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- 0 Adjust road speed of MTCVs to the configuration and condition of the roadway.
- 0 Adjust road speed of MTCVs to weather and visibility conditions.
- 0 Adjust road speed of MTCVs to vehicle, cargo and driver conditions.
- 0 Adjust road speed and space around vehicle to accommodate other traffic.
- 0 Obey the legal speed limit.
- 0 Select the lane of travel which offers best mobility and least traffic interruption, in accordance with the law.
- 0 Establish a safe gap before changing lanes, passing other vehicles, and crossing or entering traffic.
- 0 Position the vehicle correctly in the lane of travel thereby minimizing hazards to other road users.
- Position the tractor and trailers appropriately while initiating and completing various maneuvers such as curves, exit and entrance ramps, lane changes, and turns.
- Maintain a following distance appropriate to traffic flow, road surface, weather, visibility and vehicle weight configuration.
- 0 Must be able to avoid road hazards, debris and overhead structures with inadequate clearance.

KNOWLEDGE OBJECTIVES

Driver must know:

- The relationship of speed to stopping distance, hydroplaning, fuel economy and crash severity.
- What effects the points of articulation will have on speed management.
- What effects the points of articulation will have on the ability to maneuver.
- How to minimize rear trailer sway or amplification, sometimes referred to as crack-the-whip effect.

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- 0 The effect of vehicle weight distribution, center of gravity, vehicular stability, and road surface conditions on the maximum safe speed a set of MTCVs can travel.
- 0 The relationship between speed and sight distance.
- 0 The minimum safe following distance under various road, weather and traffic conditions.
- 0 That moving MTCVs encounter more air resistance than singles, especially with crosswinds. This is attributable to both the gaps between the trailers and to the increased overall length.
- 0 As vehicle speed increases, the angle decreases at which directional or lane changes can be made safely.
- 0 That speed adjustment is particularly critical on older roads built for smaller, slower vehicles.
- 0 State regulations concerning following distances, lane use, changing lanes, and passing other vehicles with MTCVs.
- 0 The appropriate following distance for various load configurations and road, weather and traffic conditions.
- 0 The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards.
- 0 The importance of proper positioning of the vehicle in its path of travel in response to road, weather and traffic conditions.
- 0 The importance of timing, acceleration and traffic gaps in order to manage space in traffic.
- 0 The dangers created by overhead obstructions.

SKILL OBJECTIVES

The driver must judge:

- The maximum safe speed at which a curve can be entered; that traction will permit; and, at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes.
- The minimum safe following distance under various road, weather and traffic conditions, using the following basic rule: Allow one second of space for each 10 feet of vehicle length at speed below 40 mph, At speed above 40 mph add one second for safety.

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ATTITUDE OBJECTIVES

The driver must believe:

- That driving skill and experience (proficiency) cannot compensate for speed that is excessive for prevailing conditions.
- There are situations where the speed limit may be too fast for road, weather and or traffic conditions.
- That obeying the speed limit is beneficial to the driver, his / her employer and will reduce the risks of having an accident.
- That courtesy on the highway is a good safety principle to follow.
- That the ability to respond to changing road conditions requires proper speed and space Management techniques.
- That maintaining maximum separation from other vehicles increases sight distance and the opportunity to maneuver in response to hazards.
- That maintaining a minimum safe following distance under various road, weather and traffic conditions is important.
- That proper positioning of MTCVs is important to accident prevention.
- That it is the driver's responsibility to position the vehicle in such a way as not to impede other road users.
- That intimidating other road users by not maintaining minimum safe following distance under prevailing road, weather and traffic conditions is illegal, unsafe, and detrimental to public relations.
- When bobtailing, pulling an empty trailer(s) or pulling unstable or unevenly balanced loads, the basic formula for safe following distance needs to be increased.

Major supporting concepts

- Because MTCVs generally weigh more than 80,000 pounds and are longer than single-trailer trucks, the ability of these combinations to move compatibly with traffic has been a concern. In moving traffic, MTCVs must have sufficient horsepower, engine torque, and drive train efficiency to climb hills, pass other vehicles, and merge with traffic without creating excessive speed differentials between themselves and other vehicles. Such speed differentials increase the likelihood of accidents, particularly on two-lane roads. One study pointed out that a speed differential of 15 mph between vehicles can increase the accident rate by 8.9 times; a differential of 20 mph, 15.5 times. MTCVs must also be able to regain speed after stopping or when making a turn across an intersection, in order to clear it in the time available in gaps between oncoming traffic.

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- 0 Driving too fast for road, weather, visibility and traffic conditions is a major cause of accidents. A professional driver must adjust his / her speed to prevailing driving conditions.
- 0 There are three components to total stopping distance: **perception** distance, **reaction** distance, **braking** distance (includes 'brake lag" and effective braking distance).
- 0 Moving MTCVs encounter more air resistance than single trailers. This is especially true with crosswinds. The effect is, attributed to both the gaps between the two trailers and to the increased overall length,
- 0 Drivers must believe that driving skill and experience (proficiency) cannot compensate for speed that is excessive for prevailing conditions.
- 0 There are numerous conditions under which the legal speed limit may be unsafe for the prevailing road, traffic, and weather conditions.
- 0 The driver must be able to judge the maximum safe speed at which a curve can be entered; that traction will permit; and, at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- 0 As vehicle speed increases, the angle at which multiple trailer can safely execute directional changes decreases significantly. For example, a lane change at 15 mph could be made at a 45 degree angle while at 50 mph a significantly smaller angle would be required.
- 0 Accurate speed adjustment is particularly critical on older roads built for cars of their day and frequently inappropriate for the characteristics of modern vehicles such as MTCVs. Some examples of the problems are: numerous curves and hills; narrow lanes and bridges; low, narrow soft shoulders; many near-road obstacles; changes in the number of lanes; poor or absent markings; and deteriorating edges, chuck holes etc.
- 0 Traction is friction between the tires and the road surface. Without traction you will lose steering and braking capacity. It will take longer to stop and it will be harder to turn when the road is slippery.
- 0 The heavier the load on a trailer, the more work the brakes must do to stop the vehicle and the more heat they absorb. But, the trailer brakes, tires and suspension are designed to work best with a loaded trailer.
- Empty trailers require greater stopping distance than loaded trailers, because an empty trailer has less traction. It can bounce and lock up its wheels, giving much poorer braking.
- 0 Drivers must adjust their speed for curves in the road. If you take a curve too fast, the wheels can loose their traction creating a skid or the wheels may keep their traction and the vehicle rolls over. Tests have shown that trailers with a high center of gravity can roll over at the posted speed limit for a curve.
- 0 Braking in a curve is dangerous because it is easier to lock up the wheels and cause a skid or jackknife. Slow to a safe speed before you enter a curve

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and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.

- 0 The principles of space management includes the concept of a space cushion around the vehicle. This is to encompass the space ahead, above and to the sides of the vehicle. Included is the concept of space for traffic gaps and giving space to others with whom we share the road.
- 0 Poor or bad driving behavior by either truck drivers or others operating in close proximity to the vehicle is especially risky. It places the vehicle close to the limits of its safe driving range, greatly reducing margins for even slight errors by either the truck driver or others operating nearby.
- 0 Some states require a minimum distance to be maintained between a multiple trailer combination and other vehicles except when overtaking or passing. By example the Colorado revised statutes require a minimum of six hundred feet (600) , except when overtaking and passing.
- 0 A safe driver always knows what's going on all around his / her vehicle and allows himself/herself a space cushion or safety zone within which to operate his / her vehicle.
- 0 **A safe rule for maintaining a minimum safe following distance is:**
 - Allow one (1) second for every 10 feet of vehicle length (or fraction thereof) for speed up to 40 mph.
 - For speeds above 40 mph, add another second to the basic requirement.
 - For bad weather, poor visibility or poor road conditions, add at least another second. If conditions are extremely severe, additional seconds may be required.
 - . Add one or more seconds when conditions restricts visibility (i.e. rain, snow, fog, smoke)
 - . When highways are wet, add at least two (2) seconds to the basic formula.
 - Add one (1) second for night driving.
 - When following other trucks, extra space for sight distance is required.
 - When bobtailing, pulling an empty trailer (s), pulling unstable or unevenly balanced loads or trailers, the following distance needs to be increased.
- 0 A gap is defined as an open space in traffic. Safer gaps are needed to pass (both meeting oncoming vehicles and overtaking vehicle ahead), enter traffic, cross traffic, and merge into traffic
- 0 Not only do **MTCVs** occupy more space, but they accelerate more slowly than smaller vehicles. This leaves larger gaps in front of them during stop-and-go conditions.
- 0 The MTCV driver must be able to assure a safe gap before changing lanes, passing other vehicles, merging, and crossing or entering traffic.

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- Drivers must be able to judge adequacy of gaps for passing, for crossing and entering traffic, and for changing lanes.
- In judging adequacy of gaps, driver must learn when it is safe to go and how long the maneuver will take. It takes experience for car drivers and tractor-semitrailer drivers to learn how to judge gaps. The MTCV driver needs to relearn that experience due to difference in vehicle sizes and handling.
- To judge and maneuver into gaps successfully, driver needs experience to learn:
 - Affects of size of vehicle.
 - Acceleration capability of different equipment (vehicles) and different loads (weights).
 - Vehicle handling characteristics of the vehicle being driven.
- Longer combinations may disrupt traffic in freeway merge situations. If the LCV or twin is not able to gain enough speed within the acceleration lane to merge or find a gap long enough to safely move, a problem is created. If the vehicle cannot find an acceptable gap on first entering the acceleration lane, they must slow down or even stop, thus making it even more difficult to find a gap. Traffic behind the vehicle in this situation would be delayed and might be forced into making dangerous maneuvers to get into the traffic stream.

MATERIALS

Classroom instruction must be supported by materials presenting information on speed and accidents, including visuals that illustrate the effects of various factors on speed and space management.

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3.3 Night Operations

Purpose

This unit provides instruction on the principles of Night Operations. Emphasis is placed on the factors affecting operation of **MTCVs** at night. Night driving presents specific factors that require special attention on the part of the driver. Changes in vehicle safety inspection, vision, communications, speed management and space management are needed to deal with the specific problems night driving presents.

Outline of Suggested Content

➤ Night driving factors

A. Driver factors.

1. Vision.
2. Glare.
3. Fatigue.
4. Driver experience.

B. Roadway factors.

1. Level of illumination.
2. Variations in level of illumination.
3. Familiarity with roads.
4. Other road users.
5. Alcohols and drugs on the road.

C. Vehicle factors

1. Headlights.
2. Marker lights.
3. Auxiliary lights.
4. Turn signals.
5. Windshields.
6. Mirrors.
7. Length of vehicle.

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D. Conspicuity

1. Principle of conspicuity.
2. Levels of illumination & reflective markings.
3. Positioning of vehicle and visibility.
4. Turning maneuvers and visibility of vehicle.
5. Rear and side underride potential.

➤ Night driving procedures

A. Preparation to drive at night.

1. Getting yourself ready.
2. Plan your route.
3. Getting your vehicle ready.
4. Vehicle Safety Inspection at night.

B. Driving at Night

1. Avoid blinding others.
2. Avoiding glare.
3. Maximizing visibility.
4. Adjusting basic driving techniques.

C. Speed and sight distance at night.

1. Sight distance and 12 to 15 second rule.
2. Effect of sight distance on perception and total stopping distance.
3. Effect of illumination on field of vision.
4. Speed limit may be too fast.
5. Problems encountered when a safe speed is slower than the speed limit.

D. Space cushion around vehicle at night.

1. Space to the sides.
2. Space ahead of vehicle.
3. Affect on space behind vs. ahead.
4. Legal requirements for following distance.
5. Traffic gaps and merging situations.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Judge the maximum safe speed at which vehicle control can be maintained under various levels of illumination.
- Adjust speed, following distance, and gap selection to nighttime conditions.
- Judge when to use high beams on headlights when legally permitted.
- Dim headlights, in accordance with state laws, to minimize interference with visibility of other drivers.
- Respond safely to the glare of other vehicles by averting eyes and not retaliating.

KNOWLEDGE OBJECTIVES

Driver must know:

- The effect of the level of illumination on ability to see (sight distance).
- The relationship between speed, illumination and sight distance.
- The appropriate following distance for various load configurations, road, weather and traffic conditions at night.
- The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards at night.
- The value of high beams to nighttime visibility.
- State laws governing use of headlights, high beams and auxiliary lights.
- The symptoms and dangers of fatigue.
- The effect of headlight glare on visibility of others and its implication for the safety of both road users.
- The general factors affecting night vision including interior illumination, ambient light and use of sunglasses during daytime.

SKILL OBJECTIVES

The driver must judge:

- Speed, distance, and separation between traffic under nighttime conditions.
- The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes at night.

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ATTITUDE OBJECTIVES

The driver must believe:

- The ability to see clearly diminishes at night.
- Driving skill and experience (proficiency) cannot compensate for speed that is excessive for levels of illumination and sight distance.
- There are situations where the speed limit may be too fast for levels of illuminations or sight distance.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards at night.
- That maintaining a minimum safe following distance under various levels of illumination is important.
- No one is immune to the effects of fatigue.
- That retaliating to other road users by using high beams is illegal, unsafe, and detrimental to public relations.

Major supporting concepts

- Driving too fast for level of illuminations (sight distance) is a major cause of accidents. A professional driver must adjust his / her speed to prevailing driving conditions.
- Drivers must believe that driving skill and experience (proficiency) cannot compensate for speed that is excessive for sight distance.
- There are numerous conditions under which the legal speed limit may be unsafe for the available illumination.
- The driver must be able to judge the maximum safe speed (of MTCVs) under various levels of illumination.
- Braking in a curve is especially dangerous at night due to reduced sight distance. Slow to a safe speed before you enter a curve and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.
- A safe driver always knows what's going on all around his / her vehicle and allows himself/herself a space cushion or safety zone within which to operate his / her vehicle. Never overdrive your headlights.
- Keep speed within sight distance. Sight distance is limited to range of headlights. Speed must be lowered to reduce stopping distance. If speed exceeds sight distance, the driver is "overdriving" his / her headlights. Reduce speed as necessary to keep stopping distance within sight distance.
- The average clean headlight provides only 300 feet of illumination ahead of the vehicle. With the high beam on this distance is increased to approximately 500 feet of illumination.

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- Smoking constricts the blood vessels in the eye of a driver reducing his / her night vision capability.
- A safe rule for maintaining a minimum safe following distance at night is:
 - Allow one (1) second for every 10 feet of vehicle length (or fraction thereof) for speed up to 40 mph.
 - For speeds above 40 mph, add another second to the basic requirement.
 - For bad weather, road conditions or poor visibility, add at least another second.
 - Add one or more seconds when weather restricts visibility (i.e. rain, snow, fog)
 - When highways are wet, add at least two (2) seconds.
 - **Add one (1) second for night driving.**
 - When following other vehicles, extra space is required to reduce the likelihood of blinding other vehicles with your headlights.
- Failure to adjust speed at night will result in not enough time and space to react to hazards.
 - Driver could lose control of vehicle if adjustment is too rapid.
- Clean lights and windshields are a must for safe night operation.
 - Dirty headlights can reduce illumination ahead up to 50 percent.
 - Even clean windshields cut out 5 percent of available light.
 - Just a few minutes of driving on wet roads can put enough dirt on your headlights to reduce their effectiveness by as much as 70 percent. The dirt acts as a filter, diffusing the light and reducing visibility.
 - A headlight out of line by even as little as one degree loses as much as 30 percent of its effectiveness.
- Poorly illuminated trailers can increase the risk of side underride collisions. Without special measures to increase its visibility at night, the trailers may not be reflected soon enough for the other vehicular driver to react.
- Increased conspicuity on the sides and rear of trailers may be a factor in reducing the probability of underride by smaller vehicles.
- Poor visibility (conspicuity) is one of the primary factors in nighttime truck accidents. However, the Occurrence of these accidents can be dramatically reduced by applying high intensity reflective tape on truck trailers
- Lighting of the third or rear trailer is a safety factor. Driver should be careful to check lighting connectors and the intensity and cleanliness of lights and reflectors.
- Automobile drivers have a difficult time at night correctly perceiving the shape, road position, location, and speed of poorly illuminated trailers. This problem makes rear and/or side underride accidents even more likely.

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- Given the increased length of the MTCV configuration, special effort is needed to increase the visibility of the sides and rear of the MTCV combination.
- Reflective long load signs are required in some states (Oregon) for night operation of long combination vehicles such as lung doubles and triples.

MATERIALS

Classroom instruction must be supported by materials presenting information on night driving procedures and the effects of various factors on sight distance and conspicuity. Include visuals demonstrating the effects of darkness and the consequences of improper night driving procedures.

New trainees must be provided the opportunity to pre -trip, build, stage, or assemble units at night as part of the night operations curriculum.

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3.4 Extreme Driving Conditions

Purpose

This unit provides instruction on driving MTCVs under Extreme Driving Conditions. Emphasis is placed on the factors affecting the operation of MTCVs in cold, hot and stormy weather and in the mountains and the desert. Changes in basic driving habits are needed to deal with the specific problems presented by these Extreme Driving Conditions.

Outline of Suggested Content

➤ Cold weather operation

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, fuel mixture, heater, defroster, windshield wipers, washer fluid, brakes, fifth wheel, etc.
2. Tires, mud flaps and tire chains, condition, types, installation etc.
3. Cold weather starting procedures.
4. Road and weather condition hazards while doing VSI.
5. Freeing a stuck vehicle or frozen brakes.

B. Driving in cold weather.

1. Vehicle speed, weight and stopping distance under various road conditions.
2. Total vehicle weight and traction under various road conditions.
3. Weight distribution in each trailer.
4. One or more empty trailers.
5. Wind resistance and crosswinds under various road conditions.
6. Effect of gap between trailers under various road conditions.
7. Road curves grades and crowns under various road conditions.
8. Shaded areas and bridges freeze first.

➤ Hot weather, desert conditions.

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner defroster, windshield wipers, windshield washer fluid, brakes, fifth wheel, etc.

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2. Tires and brakes, condition, types, pressure etc.

B. Driving in desert conditions.

1. Procedures and hazards.
2. Effects upon vehicle operation.
3. Effects upon driver alertness.
4. Breakdown procedures.

➤ Mountain driving*

A. Gravity.

1. Total vehicle weight and speed control.
2. Weight distribution in each trailer.
3. One or more empty trailers.

B. Mountain pre-inspection.

C. Operating on upgrades.

D. Operating on downgrades.

E. Auxiliary braking devices (engine retarders).

F. Truck escape ramps.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES: Adverse Weather

Driver must be able to:

- Prepare for operation in cold weather including use and installation of tire chains when necessary.
- Inspect vehicle and prepare for cold weather operation by paying special attention to coolant level and mixture of anti-freeze, fuel mixture, moisture in air tanks, heater, defroster, windshield wipers, washer fluid, brakes, fifth wheel, etc.
- Check for ice accumulation on brakes, slack adjusters, air hoses, electrical wiring, etc.
- Judge the maximum safe speed at which vehicle control can be maintained under various weather and road conditions.
- Adjust speed, following distance, and gap selection to weather and road conditions.

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KNOWLEDGE OBJECTIVES: Adverse Weather

Driver must know:

- The conditions that produce low traction and the effects of rain snow and ice on the ability to maneuver **and/or** stop MTCVs.
- The relationship between vehicle speed, weight and stopping distance under adverse weather conditions.
- The causes and procedures for avoiding skidding, hydroplaning and jackknifing MTCVs.
- The appropriate following distance for various MTCV load configurations, road, weather and traffic conditions under adverse weather conditions.
- The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards encountered under adverse weather conditions.
- How and where to mount and dismount tire chains on MTCVs.

SKILL OBJECTIVES: Adverse Weather

The driver must:

- Adjust rate of change in speed (acceleration and deceleration) and direction of travel to road and weather conditions to maintain control of vehicle.
- Judge appropriate speed, distance, and separation between traffic under adverse weather conditions.

ATTITUDE OBJECTIVES: Adverse Weather

The driver must believe:

- That adverse weather conditions require special driving techniques and increased vigilance on the part of MTCVs drivers.
- Driving skill and experience (proficiency) cannot compensate for speed and directional changes that are excessive for weather and road conditions.
- There are situations where the speed limit may be too fast for road, weather and traffic conditions.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards .
- That it is especially important for drivers of MTCVs to keep themselves informed of latest weather and road conditions.

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PERFORMANCE OBJECTIVES: Hot Weather, Desert Conditions

Driver must be able to:

- 0 Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner, defroster, windshield wipers, windshield washer fluid, tires, brakes, fifth wheel, etc.
- 0 Adjust driving habits to accommodate effects of desert heat.

KNOWLEDGE OBJECTIVES: Hot Weather, Desert Conditions

Driver must know:

- Procedures and hazards for hot weather, desert driving.
- The effects of hot weather driving on engine operating range, cooling system, fuel system, tires / tire pressure and the driver himself/herself.

SKILL OBJECTIVES: Hot Weather, Desert Conditions

The driver must:

- 0 Judge road direction and distance in the desert.

ATTITUDE OBJECTIVES: Hot Weather, Desert Conditions

The driver must believe:

- 0 That hot weather can affect vehicle operation.
- 0 That special precautions are required in inspecting MTCVs and preparing for hot weather / desert operation.
- 0 That it is dangerous to leave a vehicle when it is disabled in the desert.

PERFORMANCE OBJECTIVES: Mountain Driving

Driver must be able to:

- 0 Do a mountain pre-inspection and adjust brakes if necessary.
- 0 Place transmission in appropriate gear while ascending and prior to descending grade.
- 0 Use proper braking techniques while descending grade.

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KNOWLEDGE OBJECTIVES: Mountain Driving

Driver must know:

- 0 The effect of vehicle weight distribution and speed on downhill braking techniques.
- 0 The function and value of escape ramps.

SKILL OBJECTIVES: Mountain Driving

The driver must:

- 0 Utilize appropriate gear for descending grade.
- 0 Operate braking system for maximum efficiency and safety.

ATTITUDE OBJECTIVES: Mountain Driving

The driver must believe:

- 0 The proper gear and appropriate downhill braking technique is important to safely descend a mountain.
- 0 That use of a truck escape ramp is safer than attempting to negotiate a downgrade when the vehicle is out of control.

Major supporting concepts

- 0 Driving too fast for weather conditions is a major cause of accidents. A professional driver must adjust his / her speed to prevailing weather and road conditions.
- 0 The driver must be able to judge the maximum safe speed according to weather and road conditions.
- 0 Braking in a curve is especially dangerous in adverse weather conditions. Slow to a safe speed before you enter a curve and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.
- 0 Failure to adjust speed to prevailing weather conditions will result in not enough time and space to react to hazards.
 - 0 Driver could lose control of vehicle if adjustment is too rapid.
- 0 Some agencies (states) want drivers to drop the second trailer at specific drop pads in route during adverse weather. Other agencies will not allow multiple trailer combination units on their highways during adverse weather.
- 0 Drivers should be aware of both their vehicle's and their personal limitations, so that they can better recognize when conditions are too hazardous to drive.
- 0 There are individual state permit authorities which limit the scope of operation of an LCV due to adverse weather.

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- Many mountainous states have specific requirements for chain use under varying weather conditions. In some western states, location requirements may vary among various highway districts. Here is a standard example of chain (wheel) location for a typical MTCV:
 - Drive axle ▶ Inside and outside duals.
 - Front trailer ▶ Outside duals.
 - Converter gears ▶ Outside duals.
 - Rear trailer(s) ▶ Rear axle outside duals.
 - Some states may have maximum speed limits for vehicles with chains.
 - Chains on drive axles improve pulling power going uphill. Chains on trailer wheels improve braking going downhill.
- The National Weather Radio Service provides constantly updated weather forecasts (162.40 - 162.475 - 162.55 MHz) from many locations around the country. It is especially important for drivers of multiple trailer combinations to keep themselves informed of latest weather and road conditions.
- Moving MTCVs encounter more air resistance than tractor-semitrailers. This is especially true with crosswinds. This effect is due to the overall length and to the additional gap between the trailers.
- The effect of side wind forces increases with the size of the vehicle. This increases the danger of sudden wind shifts in adverse weather. For MTCVs, there is the danger of driving into a strong head wind and then suddenly turning or cornering. The head wind suddenly becomes a cross wind.

MATERIALS

Classroom instruction must be supported by materials presenting information on extreme driving conditions and procedures for operating in extreme conditions. Projected visuals, films or classroom models should be used to demonstrate the effects of slippery surface conditions on vehicle control. Dynamic visuals showing the effective use of escape ramps should be included.

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3.5 Proficiency Development: Safe Operating Practices

Purpose

This unit provides drivers (trainees) an opportunity to refine, within the on-street traffic environment, their vehicle handling skills learned in the first three sections. Driver performance will be closely monitored on progress towards the level of proficiency required for carrying out the basic traffic maneuvers of stopping, turning, merging, straight driving, curves, lane changing, passing, driving on hills, through traffic restrictions and parking. The driver will also be assessed for regulatory compliance with all traffic laws.

Nearly all activity in this unit will take place on the public roadway in a full range of traffic environments applicable to this vehicle configuration. This is to include urban and rural uncontrolled roadways, expressways or freeways, under light, moderate and heavy traffic conditions. There is a brief classroom session to familiarize drivers with the type of on-street maneuvers they will perform and how their performance will be rated.

The instructor will assess level of skill development of the trainee and increase in difficulty the types of maneuvers, roadways and traffic conditions the driver trainee is exposed to based upon his / her level of skill attainment.

Outline of Suggested Content

➤ Introduction to on-street proficiency development (Classroom)

- A. Description and purpose of on-street instruction.
 - 1. Safe operating procedures.
 - 2. Types of maneuvers on-street driving.
 - 3. Route planning.
- B. Procedures and practices.
 - 1. Safe operating procedures.
 - 2. Performance groups for on-street driving.
 - 3. Commentary driving techniques.
- C. Standards for performance evaluation.
 - 1. Vehicle control skills.
 - 2. Performance checks (criteria) for on-street driving.
- D. Safety rules for on-street driving.

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➤ Proficiency development: Safe operating practices

- A. On-street driving preparation.
 - 1. Vehicle safety inspection.
 - 2. Build (couple) MTCV.
- B. Vehicle familiarization (low-density traffic conditions).
 - 1. Starting, upshifting, downshifting and stopping.
 - 2. Lane - keeping / straight.
 - 3. Lane - keeping / curve.
 - 4. Lane - keeping / turn.
 - 5. Right turns.
 - 6. Left turns.
 - 7. Driver trainee evaluation and feedback.
- C. Practice in safe operating practices: On-street
(Instructor discretion as to route and amount of traffic)
 - 1. Visual search techniques.
 - 2. Communications techniques.
 - 3. Speed management.
 - 4. Space management.
 - 5. Hazard perception and commentary driving.
 - 6. Night driving.
 - 7. Situations:
 - a. Various roadways based on skill attainment.
 - b. Controlled and uncontrolled interchanges.
 - c. Freeway interchanges.
 - d. Hills and grades.
 - e. Vehicle merges.
 - f. Traffic restriction areas.
 - g. Traffic control areas (stop sign or light controlled intersections).
 - h. Blind intersection.
 - i. Parking.

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➤ Skill attainment evaluation

- 0 Trainee performance is evaluated against a prescribed criteria, including these basic control factors:
 1. **Acceleration:** Smooth acceleration; no jerky, abrupt acceleration from a standing start and when increasing speed.
 2. **Braking:** Smooth, controlled stops, no rebound of front end or sound of exhausting air.
 3. **Stopping point:** Comes to a complete stop within 3 feet of stopping point or within sufficient distance from the vehicle ahead.
 4. **Upshifting:** Shifts through all gears without hesitation. Does not miss or skip a gear causing lurching / lugging (failure to shift soon enough). Shifts smoothly at proper RPM without jerking the vehicle. Double clutches all shifts with a minimum of grinding.
 5. **Downshifting:** The gear selected is suitable to the road speed of the vehicle driven. Shifts smoothly without hesitation and minimal grinding of the gears. Double clutches all shifts.
 6. **Uphill Operation:** The gear selected is suitable to the road speed and gradeability of the engine. Driver shifts smoothly without hesitation and minimal grinding. Double clutches all shifts.
 7. **Starting On An Incline:** Driver pulls away from the stop smoothly. Engine remains running. Vehicle does not roll back. Driver properly coordinates the parking brake, foot brake, and throttle resulting in the vehicle pulling away smoothly.
 8. **Downhill Operation:** Driver starts down the hill in the proper gear and uses the appropriate braking technique for the decline. Speed does not exceed the posted speed limit.
 9. **Speed Adjustment - Curves:** Driver adjust speed prior to entering curve and maintains appropriate speed throughout curve. Driver does not shift or brake in the curve.
 10. **Lane-Keeping - Straight:** Driver maintains lane position in path of travel without touching or crossing lane markings.
 11. **Lane-Keeping - Curve:** Driver maintains lane position in path of travel without wandering back and forth between lines or touching or crossing lane markings.
 12. **Lane-Keeping - Turn:** Driver operates vehicle within the designated lane without crossing lane demarcation lines or running off pavement edge, unless vehicle length and street width necessitates encroachment.

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- a. **Right Turn:** Driver negotiates right turn without trailer tires crossing lane demarcation line, touching curb or running off pavement edge, unless vehicle length and street width requires it.
 - b. **Left Turn:** Driver negotiates left hand turn without cutting across the top of the turn (crossing the center line of the street he/she is entering), unless vehicle length and street width requires it.
13. **Curves:** Driver holds lane position without drifting or weaving. Trailer wheels are kept within lane markings and driver steers appropriately to the far left or right to compensate for the off-tracking of the trailers.
14. **Signaling:** Driver activates appropriate signal before performing maneuver. Driver cancels signal before upshifting or within 5 seconds of accomplishing maneuver.
15. **Mirror Checks:** Driver makes regular checks (approximately every ten seconds) of his / her mirrors to be aware of traffic and to check condition of vehicle.
16. **Mirror Checks - Turns:** Driver checks position of trailer with appropriate mirror or by looking over his / her shoulder when the rear of the trailer reaches the top of the turn.
17. **Mirror Checks - Lane Change:** Driver checks appropriate mirror before initiating lane change. Driver maintains lane position while checking appropriate mirror.
18. **Mirror Checks - merge:** Driver checks appropriate mirror before initiating lane change.
19. **Lane changing:** Driver pauses briefly (subsequent to signaling and checking mirror) before crossing lane delineator. Lane change is gradual and not abrupt. Driver maintains control of the vehicle and does not allow vehicle to wander,
20. **Merging:** Driver activates the turn signal in the direction of the intended merge before initiating merge; the vehicle is properly aligned to the roadway before a mirror check is made; driver makes a mirror check before initiating the merge.
21. **Traffic restrictions:** Driver obeys all traffic restrictions. i.e. using correct lane, obeys traffic control devices, maintains a safe speed below the posted speed limit, yields the right of way, drives within solid delineator or zebra stripe, etc.
22. **Uncontrolled intersection:** Driver looks both ways prior to entering the intersection; chooses appropriate rate of speed / gear for conditions.
23. **Railroad crossing:** Driver looks both ways prior to traveling over a railroad crossing; chooses an appropriate rate of speed / gear for conditions and doesn't shift gears while traveling through the railroad crossing.

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24. **Blind intersection:** Driver reduces speed and looks towards the blind intersection prior to entering it.
25. **Parking:** Driver considers or plans for the vehicles exit prior to positioning the vehicle. Driver is legally and appropriately parked while not blocking other traffic. Driver sets the parking brake and puts the vehicle in the proper gear and or blocks the wheels.
26. **Right of way:** Driver proceeds on a technical right of way only when safe and appropriate. When appropriate driver yields the right of way. Driver exercises due caution for other vehicles and for pedestrians regardless of who has right of way.
27. **Following distance:** Drive constantly maintains adequate following distance, never crowding other vehicles.
28. **Vision management:** Driver scans for hazards as evidenced by eye and or head movement. Driver exhibits good vision management by identifying what he/she sees through the use of commentary driving techniques.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- No new objectives.

KNOWLEDGE OBJECTIVES

Driver must know:

- No new objectives.

SKILL OBJECTIVES

Driver must:

- No new objectives.

ATTITUDE OBJECTIVES

The driver must believe:

- No new objectives.

This unit introduces no new instructional objectives. The in vehicle instruction provided for in this unit is intended to allow the driver trainee the opportunity to develop proficiencies, relative to all prior instructional objectives, to a level needed to pass the proficiency exam.

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Major supporting concepts

- Basic control skills and maneuvers tests are used as an objective measuring device to determine when trainees have attained a sufficient degree of knowledge, skill and judgment of vehicle spatial requirements and self confidence necessary to commence the on-road training.
- Trainees should be provided practice in basic vehicle operation in low density traffic conditions before going on to more difficult on-road practice.
- Street routes must represent the broadest range of traffic situations to allow the driver trainee the opportunity to develop the skill necessary to operate safely and effectively on his / her own.
- In this unit, instructors should provide assistance to the trainees by:
 - Providing positive communications between the instructor and the trainee through the use of commentary driving techniques.
 - Accurately assessing the skill development of the trainee and exposing the trainee to the proper set of circumstances (road , traffic, etc.) to enable the learning process.
 - Warning them as to potential hazards, excessive speed, insufficient clearance and safety margins.
- To drive the vehicle in situations requiring sharp turning movements (particularly in tight quarters), on hills and in other situations requiring precise movements, MTCV drivers need to coordinate use of vehicle controls and make skilled and properly timed actions based on sound judgments and decisions. Techniques and underlying concepts required for developing smoothness and precision in these maneuvers is an important part of the driver training curriculum.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by MTCV drivers. Also required are printed or visual materials that describe common hazards and the frequency with which they are encountered and materials that review commentary driving techniques.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as:

- Observer checklist.
- Rules for un-street driving.
- Driver performance scoring criteria checklist or scoring forms.

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UNIT 3.5 DRIVER RULES FOR ON-STREET DRIVING

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow all instructions given by the driving instructor. If you do not understand an instruction, ask for clarification before proceeding.
- D. Alert the driving instructor to any malfunction or potential malfunctions indicated by gauges, warning lights, etc.
- E. Obey all traffic laws.
- F. Carry your drivers license or learners permit, medical certificate, and logbook at all times.
- G. No trainee may drive after drinking any alcoholic beverage or when he/she is taking prescribed drugs or other medication that may affect his / her ability to drive safely.
- H. Check your path carefully before moving.
- I. Trainees in the vehicle who are not driving, must be observing the driver and the road ahead. They may not carry on conversations that will distract the driver.

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SECTION 4 - Advanced Operations

The units in this section introduce higher level skills that can be acquired only after the more fundamental skills and knowledge taught in sections two and three have been mastered. The purpose of this section is to teach the perceptual skills necessary to recognize potential hazards and to demonstrate the procedures needed to handle a MTCV combination vehicle when faced with a hazard.

Unit 4.3 of this section provides instruction on how to keep the vehicle in safe and efficient operating condition. The purpose of this unit is to teach how to perform simple maintenance tasks and how to troubleshoot and report those activities that must be performed by a qualified mechanic.

Three units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
4.1	Hazard Perception	4			2	6
4.2	Hazardous Situations	3				3
4.3	Maintenance and Troubleshooting	2	2			4
TOTAL		9	2	0	2	13

4.1 Hazard Perception

Purpose

This unit provides instruction on the principles of recognizing hazards in sufficient time to reduce the severity of the hazard and neutralize a possible emergency situation. While hazards are present in all motor vehicle traffic operations, some are peculiar to MTCV combinations. Emphasis is placed on hazard recognition, visual search, and response to possible emergency producing situations encountered by MTCVs in various traffic situations.

Outline of Suggested Content

➤ Importance of hazard recognition

- A. Definition of a hazard.
- B. Role of visual search in hazard perception.
- C. Methods used in hazard perception.
- D. Sources of clues / where to look.

➤ Road characteristics

- A. Nature of problems encountered.
- B. Surface conditions due to weather, debris or construction.
- C. Shape and contour of the road.
 - 1. Tight curves with insufficient superelevation.
 - 2. Hazardous sequence of curves.
 - 3. Short deceleration lanes.
 - 4. Curb placement on curves.
 - 5. Ramp downgrades leading to tight curves.
 - 6. Off-tracking of MTCVs.
 - 7. Speed advisory signs for curves / ramps appropriate for cars not trucks.
- D. Visibility restrictions.
 - 1. Rain, sleet, snow, low clouds in mountains, fog and smoke.
 - 2. Dawn, dusk and night.
 - 3. Objects in line of sight.

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E. Crosswinds.

1. Signage.
2. Identification of probable locations.
3. Change in direction of travel.

➤ Road user characteristics

- A. Drivers with obstructed vision .
- B. Distracted or confused drivers.
- C. Slow moving vehicles.
- D. Impatient or impaired drivers.

➤ Road user activities

- A. Driver or vehicle movement.
- B. Emergency areas and pedestrians/cyclists.
- C. Conflicts.

➤ Characteristics of MTCVs.

- A. Definition of sensory feedback.
- B. MTCVs have additional points of articulation and therefore require additional vigilance and skills.
- C. Effect of additional coupling points on sensory feedback.
- D. Effect of gap between trailers under various road and traffic conditions.
- E. Effect of weight distribution in each trailer.
- F. Effect of isolation from trailing units with single pintle hook couplings.
- G. Reduced ability to sense impending trailer instability i.e. sliding, rollover, or bounce.
- H. Wind resistance and crosswinds under various road configurations.
- I. Development of special kinesthetic, body “feel” or sense for the trailing unit and the dynamic forces acting on it.
- J. Role mirrors play in identifying hazardous situations.

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➤ Commentary driving techniques

- A. Definition and role in safety education.
- B. Hazard identification.
- C. Hazard description.
- D. Search, Identify, Predict, Decide, Execute (SIPDE) concepts.
- E. Examples of commentary driving techniques.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Identify (using Commentary Driving techniques) road conditions and road users that pose a potential threat to the safety of the MTCV driver.
- Adjust road speed and space around vehicle to reduce the potential threat posed by either road conditions or other road users.
- Adjust visual search pattern to compensate for the potential threat posed by either road conditions or other road users.
- Monitor trailers and identify signs of impending hazardous situations.
- Develop a special kinesthetic sense or body “feel” for the trailing unit, through experience, vigilance and appropriate mirror usage.

KNOWLEDGE OBJECTIVES

Driver must know:

- The visible characteristics of road conditions that present a hazard to safe operation. This is to include slippery, soft, sloping, or uneven surfaces, debris, dangerous curves, obstruction to visibility, and locations where there are likely to be strong crosswinds, low clouds and fog.
- The characteristics of other road users (drivers or pedestrians) that make them potentially dangerous. This is to include obstructed vision, distraction, confusion, impatience, impairment, and low speeds.
- What activities of other road users are capable of providing clues to potential danger. This is to include head and body movement, vehicle movement, and emergency or conflicting situations.
- How to compensate for the lack of understanding of others with whom we share the road.
- That the presence of MTCV trailers in the traffic stream influences the operation of other vehicles.

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- How to develop a sense for the changing dynamic forces acting on the trailers.
- The effect of delayed trailer response to driver steering.
- How to compensate for the increased number of coupling points and resulting impaired sensory feedback when driving MTCV trailers.

SKILL OBJECTIVES

The driver must:

- Perceive immediately a potential threat by the visible characteristics and actions of other road users and initiate prompt defensive or evasive action.
- Perceive immediately a potential threat by the visible characteristics of road conditions and initiate prompt defensive or evasive action.
- Focus on developing a special kinesthetic or body "feel" or sense for the MTCVs trailing unit.

ATTITUDE OBJECTIVES

The driver must believe:

- That MTCV combinations have additional points of articulation (versus tractor semitrailer) and therefore require additional vigilance and skills.
- That the ability to respond to changing road conditions requires constant vigilance and attention.
- That most hazards can be detected in time to avoid a collision.
- That serious hazards are encountered frequently enough to require constant attention to changes in the environment.
- That any delay in responding to a perceived hazard can result in an accident.
- That a professional driver has a moral obligation to himself/herself and the motoring public to do the best he/she can do.
- Professional drivers must compensate for the lack of understanding of others with whom we share the road.

Major supporting concepts

- While hazards are present in all motor vehicle traffic operation, there are special hazards peculiar to MTCV combinations.
- Hazard recognition training will help drivers recognize dangerous situations (hazards) before they become emergencies. Good visual search habits will help ensure that drivers see emergency producing situations before they become real emergencies.
- A hazard is any road condition or other road user that presents a potential danger to safety of operation. Drivers must recognize the potential dangers in the driving environment in order to respond to them before they become

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emergencies. There are many clues provided by other road users that spell danger.

- 0 Errors on the part of one operator can be compensated for by mature judgment and skill on the part of another driver in almost every situation.
- 0 Drivers must believe that most hazards can be detected in time to avoid a collision. Serious hazards are encountered frequently enough to require constant attention on the part of the driver. Any delay in responding to a perceived hazardous situation can result in an accident.
- 0 Expressway ramps are particularly hazardous to MTCVs. The design standards for these ramps are based almost exclusively on passenger car dimensions.
 - Certain ramp design parameters make it all too easy for a truck driver to lose control of his / her vehicle. A truck entering a curving highway entrance or exit ramp at high speed must slow down rapidly on a curving roadway, placing a truck at immediate risk for a jackknife or rollover accident. Compound curves, where the degree of curvature varies throughout the curve, presents a particularly difficult challenge. Speed advisory signs compound the problem by giving speeds appropriate for cars not trucks.
- 0 The following are a series of ramp situations identified by University of Michigan Transportation Research Institute (UMTRI) where the driver may face difficult control and/or handling challenges:
 - Tight curve with insufficient superelevation. Superelevation means the degree of banking — the raising of the outside of the lane surface, relative to the middle.
 - Hazardous sequence of curves. This situation, with only one posted ramp speed contains four curves, each with a different radius. Some ramps have a flatter curve between two sharper curves.
 - Short deceleration lane leading to a tight radius curve. The entrance to this exit ramp can produce both rollover and jackknife accidents.
 - Curb placed along outside of curve. Rollover may result when off-tracking rear wheels of rear trailer trip on the outside curb of the curved ramp.
 - Ramp downgrade leading to a tight curve. Ramps having a downgrade leading to a final demanding curve also pose a special problem for loaded MTCVs.
- 0 A driver's first clue of a vehicle problem, trailer sway, off-tracking, tire failure, fire, etc., is usually via the rear view mirror. The driver should maintain a visual search pattern appropriate for direction of movement, road and environmental conditions that involves frequent checking of all mirrors.
- 0 Hazards to MTCVs can be created by the highway itself including:
 - Pavement edge drops can cause special hazards for the second trailer. For example, a rear trailer tire dropping off the edge can lead to swaying.

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- Road irregularities (bumps, joints, pavement lapovers, rough surfaces, potholes etc.) affect MTCVs because they can cause the rear trailer to sway.
- Poor signing can fail to alert the driver of upcoming lane detours or path changes. An abrupt change can lead to instability in the rear trailer.
- 0 Proper choice of speed is a major tool to be used in coping with highway hazards. As speed increases the time available for hazard perception, i.e. searching, identifying, predicting, deciding and executing, decreases.
- 0 Drivers of MTCVs must develop a special kinesthetic or body "feel" or sense for the trailing units. Much of this feel is developed through experience.
- 0 Drivers of MTCVs are somewhat isolated from their trailing unit. The increased number of articulation points and the use of single pintle-hook couplings reduces the ability of the driver to "sense" impending sliding, rollover, or even bouncing of the trailing unit. This impaired sensory feedback must be compensated for by increased mirror usage,
- 0 Extreme care must be taken to keep all of your unit on the road surface at all times. If the bogie and/or rear trailer wheels drop off onto an uneven berm, it may be extremely difficult to return the unit to the road surface. There is also the possibility of upsetting the rear trailer.
- 0 When driving multiple trailer combinations through extreme dips in the road surface, care must be taken to avoid contact between the tops of the trailers.
- 0 Drivers must be careful when crossing extreme bumps, such as railroad grade crossings, because the dolly support leg (depending on the type of dolly) may contact the ground and cause damage.
- 0 Safety officials familiar with work zones cite concern for trucks in work zones. The Fatal Accident Reporting System (US DOT) data indicate that 26.6 percent of the fatal accident in work zones on the Interstate system involve trucks. Truck drivers (particularly LCV drivers) must be educated as to the dangers of the work zones and the need to use additional caution.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by MTCV drivers. Also required are printed or visual materials that describe common hazards and the frequency with which they are encountered and materials that review commentary driving techniques.

On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist.

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4.2 Hazardous Situations

Purpose

This unit provides classroom discussion on dealing with specific procedures, appropriate to MTCV emergencies. These include evasive steering, emergency braking, off-road recovery, brake failures, tire blowouts, rearward amplification, hydroplaning, skidding, jackknifing and the rollover phenomenon. The discussion will include a review of unsafe acts and the role they play in producing hazardous situations.

Outline of Suggested Content

➤ **Hazardous situations**

- A. Definition.
- B. Nature of problems encountered.
- C. Role of safe operating practices.
- D. Review of unsafe acts.
- E. Reducing the severity of the hazardous situation.

➤ **Emergency maneuvers**

- A. Role of emergency maneuvers.
 - 1. Evasive steering.
 - 2. Emergency stop.
 - 3. Off-road recovery.
 - 4. Brake failure.
 - 5. Blowouts.

➤ **Skid dynamics**

- A. Definition of friction and traction.
- B. Stage of traction.
 - 1. Static traction.
 - 2. Rolling traction.
 - 3. Sliding traction.
- C. Wheel load.

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- D. Forces of motion.
- E. Four basic causes of skids.
 - 1. Braking.
 - 2. Accelerating.
 - 3. Change in direction.
 - 4. Hydroplaning.
- F. Preventing skids.

➤ **Types of skids MTCVs can experience**

- A. Steering wheel skid.
- B. Tractor drive axle (rear wheel skid).
- C. Trailer skid.
 - 1. Single.
 - 2. Multiple.
- D. All wheel skid.
- E. Power skids.
- F. Spin-out.
- G. Hydroplaning.
- H. Summary of skid prevention.

➤ **Skid recovery**

- A. Speed control.
- B. Steering characteristics.
 - 1. Oversteering.
 - 2. Understeering.
 - 3. Neutral steering.
- C. Corrective steering.
- D. Countersteering.
- E. Braking to stop.

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➤ Rollover

- A. Definition.
- B. Rearward amplification.
- C. Trailer sway.
- D. Rollover threshold.
 - 1. Speed and direction.
 - 2. Condition of roads, curves, ramps and superelevations.
 - 3. Weight of cargo and height of vehicle's center of gravity.
 - 4. Bulk liquids and surge.
 - 5. Motion and visual cues.
 - 6. Prevention using safe driving practices.

➤ Unsafe driving acts

- A. Definition.
- B. Behavioral factors most frequently reported.
- C. Prevention using safe driving practices.

➤ Recommended responses to unavoidable emergencies

- A. All responses have to be measured and less severe than in a tractor trailer.
- B. Go easy on foot controls, use "egg shell" pressure.
- C. Use service brake only.
- D. Reduce the severity of your actions,
- E. Decide to take choice of lesser consequence when necessary.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Identify road conditions and road users that are a potential threat to the safety of himself/herself and other road users.

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KNOWLEDGE OBJECTIVES

Driver must know how to:

- 0 Incorporate safe operating practices into daily driving habits.
- Bring the **MTCV** to a stop in the shortest possible distance while maintaining directional control of the MTCV on **dry** pavement.
- 0 Bring the **MTCV** to a stop in the shortest possible distance while maintaining directional control of the **MTCV on slippery** pavement.
- Perform a "quick" evasive turn on a dry surface .
- Make an evasive turn off the roadway and return to the roadway while maintaining directional control of the vehicle.
- 0 Maintain directional control while operating over a slippery surface.
- 0 Recover from skids induced by slippery surfaces.
- Correct for vehicle's steering characteristics.

Driver must know:

- 0 The principle unsafe driving acts or behaviors that contribute to or cause the majority of motor vehicle crashes.
- 0 The role safe operating practices play in reducing the severity of hazardous situations.
- 0 That the vehicle can generally be turned more quickly than it can be stopped.
- 0 That in an impending head-on collision, it is generally safer to leave the roadway than to strike another vehicle.
- 0 The procedures for quick stops, quick turns, and evasive turns off the roadway.
- 0 The procedures for handling brake failures and tire blowouts.
- 0 The procedures for reducing the effects of rearward amplification of the rear trailer.
- 0 The procedures for minimizing the possibility of rollover.
- 0 The causes of skids.
- 0 The best prevention for skidding is to control speed and adjust driving habits to weather, road, and traffic conditions.
- The principles of skid dynamics, friction, wheel load, fidelity (tracking), force and rearward amplification.
- 0 The characteristics of a tractor or trailer (s) jackknife, steer axle skid, all wheel skid, hydroplaning and rollover.
- 0 Skid control and recovery procedures.

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SKILL OBJECTIVES

THE DRIVER MUST:

- Recognize a potential threat by the visible characteristics and or actions of the threat and initiate prompt defensive actions.

ATTITUDE OBJECTIVES

The driver must believe:

- That unsafe driving acts or behaviors cause or contribute to motor vehicle crashes.
- That it is safer to leave the road than to risk a head-on collision with another road user.
- A driver should never give up efforts to cope with an emergency.
- That most skids are preventable.
- That skids can occur at any speed.
- That it is possible to recover from skids if they are detected and corrected promptly.

Major supporting concepts

- 0 While hazards are present in all motor vehicle traffic operation, there are special hazards peculiar to MTCV combinations.
- 0 A hazard is any road condition or other road user that presents a potential danger to safety of operation. Drivers must recognize the potential dangers in the driving environment in order to respond to them before they become emergencies. There are many clues provided by other road users that spell danger.
- 0 An emergency arises when one or more drivers fail to employ safe driving practices, such as those depicted in: vehicle inspection, visual search, hazard recognition, communications, speed and space management, night operations, and extreme driving conditions.
- 0 Safe operating practices will not always prevent emergencies. No one is perfect; mistakes are bound to create emergencies. It is therefore critical that drivers know how to handle emergencies when they arise.
- 0 The emergency maneuvers and procedures defined for semi tractor trailer operation may not be appropriate for MTCV operations. Specific procedures, appropriate to MTCV emergencies, need to be defined and taught to MTCV drivers.
- 0 One of every four serious vehicle accidents involves skidding. Skidding may not have been the major cause of the accident. The driver may have compounded the problem by doing the natural thing -- slamming on the

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brakes to stop or avoid the accident hazard. This allows the vehicle to dictate its own actions. Thus, the driver automatically gave up control of the vehicle the moment the brakes were slammed on and the wheels locked,

- 0 Hydroplaning occurs when the front tires cannot displace the water on the road fast enough to permit the tires to maintain contact with the pavement. the tendency to hydroplane is affected by the depth of the water, the tread depth of the tires, and the speed of the vehicle.
- 0 The tires of lightly loaded MTCVs can experience hydroplaning when the footprint of the tires on the road surface is incapable of expelling water between the tire and the road surface.
- 0 Hydroplaning can occur at the steer tires of tractors when excess weight on the rear axle (s) lightens the front end.
- 0 TIFA (UMTRI) identifies "jackknife" as the loss of control of a truck in motion where the trailer yaws (angles) more than 15 degrees from its normal straight line path behind the cab.
- 0 Additional trailers can increase the potential for jackknife conditions since they add additional axles, piping and valves.
- 0 Jackknifing accidents can occur at a ramp location when the truck driver overbrakes to avoid rollover, The overbraking causes the tractor's drive axles to lock up, and that causes the tractor to revolve (yaw) rapidly. If the driver releases the brakes before the tractor has rotated through more than a modest angle, all of the tractor tires recover their rolling state, and this propels the vehicle to the inside of the curve.
- 0 The engine retarder is a very unbalanced brake system. It can lockup the drive axle on a slippery surface, precipitating a tractor jackknife.
- 0 Improper use of an engine retarder can induce a skid or jackknife. the potential is greatest on slippery pavement when the unit is empty or lightly loaded. the braking effect of the retarder creates "reverse torque" at the drive wheels. when traction is limited, this can cause lock-up of the drive wheels long enough to induce a skid or jackknife.
- 0 When lockup occurs on the wheels of the steering axle, the vehicle is unsteerable and cannot be directed along a curved path or around an obstacle. When lockup occurs on the wheels of the tractor's rear axle or on the wheels of a dolly's axle, the tractor or dolly is unstable in yaw resulting in a jackknife. Finally, if the wheels of the rearmost trailer lockup, that end of the trailer swings outward in a trailer swing or jackknife.
- 0 The accident data show an overinvolvement of unladen (empty) vehicles in accidents classified as jackknifing.
- 0 When MTCVs are steered through an abrupt maneuver such as a sudden lane change, the rear trailer may exhibit an exaggerated side-to-side motion often described as the "crack-the-whip" effect. This phenomenon is known

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technically as rearward amplification and may result in rollover of the rear trailer.

- 0 Rearward amplification is a characteristic of multiple trailer combinations where the lateral acceleration of the tractor is amplified rearward to the point where the rear trailer could possibly roll over. This can result in 'the driver making an evasive maneuver that feels safe in the tractor, but that can cause the rear trailer to roll over.
- 0 A driver of a MTCV may be able to steer the tractor around an immediate obstacle without approaching the rollover limits of the tractor, but the trailing units may swing out of the path of the tractor -- in a "crack the whip" fashion -- thereby going off the road or into an adjacent lane and/or rolling over due to the high lateral acceleration generated during the "correction phase" of the maneuver.
- 0 The height, position and type of cargo are important factors in determining the likelihood of a rollover.
- 0 In a tank vehicle with bulk liquids, sudden steering movements or braking applications can cause product surge and shifting of the vehicle's center of gravity. This in turn contributes to the likelihood of a rollover.
- 0 Rollover accidents occur most frequently on dry, straight roads, as do all accidents types, but they are disproportionately more prevalent on curved roads. Other vehicle factors, such as component part failures or deficiencies and shifting loads, are over represented in this type of accident.
- 0 Unsafe driving acts (UDA) are defined as driving behaviors that cause or contribute to motor vehicle crashes. A relative risk analysis for **MTCVs** would help establish more accurate priorities regarding what behaviors should be targeted for change. Though, it would appear that speed, failure to yield and following too closely are behaviors that warrant change.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazardous situations most commonly encountered by MTCV drivers. Printed or visual materials that describe unsafe driving acts (UDA) and the frequency with which they are encountered should be used for discussion purposes. Materials presenting information on physical principles of friction, traction, wheel load, forces of motion, skid control and recovery procedures and rollovers should also be used.

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4.3 Maintenance and troubleshooting

Purpose

This unit introduces drivers to the basic servicing and checking procedures for the various vehicle components and to help develop their ability to 1) perform preventive maintenance, 2) make simple emergency repairs, and 3) diagnose and report vehicle malfunctions.

Outline of Suggested Content

- **Nature and importance of preventive maintenance**
 - A. Overview of Maintenance.
 - 1. Fleet performed maintenance.
 - 2. Driver performed maintenance.
 - B. Type of maintenance.
 - 1. Routine servicing.
 - 2. Scheduled preventive maintenance.
 - 3. Unscheduled maintenance.
 - C. FMCSR inspection and maintenance requirements.
 - D. Importance of preventive maintenance.
- **Performing basic servicing and routine maintenance**
 - A. Checking and changing engine fluids and filters.
 - B. Inspecting and changing lights and fuses.
 - C. Checking tire air pressure.
 - D. Changing tire in a roadside emergency.
 - E. Draining moisture from air reservoir and fuel system.
 - F. Roadside (emergency) adjustment of brakes.
- **Diagnosing and reporting vehicle trouble**
 - A. Importance of troubleshooting and reporting.
 - B. Troubleshooting.
 - C. Reporting Requirements.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Check and service engine fuel, oil, coolant, battery, and filters involved.
- 0 Perform simple repairs to enable a vehicle to reach a maintenance facility.
- 0 Check tire air pressure.
- 0 Change wheels (with tires mounted) and check for proper tire and wheel mounting.
- 0 Drain moisture from air brake supply reservoirs and fuel system.
- 0 Check brakes and make roadside (emergency) adjustment of brakes.
- 0 Clean and repair lights.
- 0 Change fuses and reset circuit breakers.
- 0 Identify vehicle systems or components that are functioning properly, but are in imminent danger of failing, or functioning improperly.
- 0 Describe symptoms of improper operation completely and accurately to maintenance personnel.

Driver must:

- Avoid performing maintenance for which they are not qualified.
- Properly report breakdown occurring enroute.

KNOWLEDGE OBJECTIVES

Driver must know:

- The procedures for performing inspections and authorized maintenance and repairs.
- Enough to avoid attempting repairs for which they are unqualified.
- The importance of periodic inspection and repair to prevention of enroute breakdowns, long life of parts, safety, and economy of operation.
- The inspection, repair and maintenance requirements of the Federal Motor Carrier Safety Regulations.
- The symptoms of improper operation revealed through instruments and sight, sound, feel, smell, and vehicle operation characteristics.
- The danger of exceeding maintenance restrictions imposed by the employer or the driver's skill limitations.

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SKILL OBJECTIVES

Driver must:

- None.

ATTITUDE OBJECTIVES

The driver must believe:

- Preventive maintenance and repair will prevent enroute breakdowns and ensure long life of parts, safety, and economy of operation.
- It is the driver's responsibility to assure that the vehicle is in safe, economical, operating condition.
- Drivers and mechanics must work together as a team to achieve safe, economic operation for maximum job security for all employees.

Major supporting concepts

- Drivers may not be able to repair their own vehicles but they should be able to make routine safety checks, perform routine maintenance checks and servicing, and spot signs of equipment trouble.
- Keeping a MTCV rig in good maintenance and repair can help prevent breakdowns and crashes, (On road breakdowns frequently result in accidents).
- Letting a vehicle deteriorate can lead to poor performance; breakdowns on the road; accidents; excessive repair costs; less fuel mileage per gallon; and traffic violations or being placed out-of-service at roadside inspections.
- Since instruments, gauges and other signs cannot warn of all trouble in advance, and since changes in vehicle performance occur so gradually the driver fails to recognize them, preventive maintenance is important. For example, brakes wear out so gradually that the driver is hardly aware of it.
- Preventive maintenance is checking and correcting a vehicle's condition so as to catch any signs of wear or damage before they cause real trouble.
- In some fleets, drivers are required to perform basic or routine maintenance and servicing tasks as part of their jobs. Likewise, some motor carriers prohibit their drivers from performing some of these tasks.
- It costs more to repair or replace a neglected part than to perform preventive maintenance.
- There is no excuse for operating a vehicle with safety defects or operating it in such a way as to cause premature wear and tear to components.

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- 0 There are several good **reasons** why a driver should learn about the contents of this unit. Even if the driver will be employed by a fleet that has a policy of not allowing drivers to do any servicing **or** adjustments to vehicles, there are situations when the contents of this section would be very helpful:
 - o If a mechanic is adjusting the brakes and is doing it carelessly, the driver better be able to recognize the **error or** risk being involved in an accident.
 - o If the driver's rig has a breakdown late at night and it is 10 below **zero** outside and it is 15 miles to the nearest telephone, the driver will be glad to have some basic mechanical knowledge.
- 0 Drivers should be trained and conversant in FMCSR Sec.396.25 Qualification of Brake Inspectors. Note that a driver who has a CDL air brake endorsement is considered qualified to inspect but not necessarily adjust the trailer **or** tractor brakes.
- 0 Drivers aren't expected to become expert mechanics, but they should be able to identify the exact **sources** of malfunctions. Drivers must be able to identify and report symptoms accurately enough so that mechanics are able to perform the necessary diagnosis (shop) and/or to come to the site of the road breakdown with the necessary tools and parts to repair the problem.
- 0 Detecting, diagnosing, and reporting vehicle malfunctions is the driver's primary troubleshooting rule. Driver should not attempt to fix problems he/she is not fully qualified to handle.
- 0 A vehicle will, in most cases, warn the driver of impending trouble by giving off warning signals. These warning signals **come** in several different forms. The driver should have a working knowledge of the common warning signals.
- 0 The better the driver understands how vehicles work, the easier it will be to recognize the first signs of trouble and describe them accurately to a mechanic **so** that the mechanic can track down the difficulty and correct it.

MATERIALS

Classroom instruction must be supported by materials and visuals to describe and illustrate symptoms of improper operating conditions, e.g. trouble shooting charts. Preventive maintenance checklists and a broad range of tractor and trailer manufacturers' service manuals should also be used.

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SECTION 5 - Non-Driving Activities

The units in this section cover activities not directly related to the vehicle itself but which must be performed by the MTCV driver. The objectives of the units in this section are to insure that these activities are performed in a way that assures safety to the driver, the vehicle, cargo, and other road users. Unit 5.3 provides instruction on the importance of professionalism, maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

Three units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
5.1	Routes And Trip Planning	3				3
5.2	Cargo And Weight Considerations	4.5	2			6.5
5.3	Public Relations And Safety	3.5				3.5
TOTAL		11	2	0	0	13

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5.1 Routes and Trip Planning

Purpose

This unit provides classroom instruction on the importance of and requirements for planning routes and trips. This is to include classroom discussion on federal and state requirements for permits, vehicle size and weight limitations, designated highways, local access, the reasonable access rule, staging areas, access zones, etc.

Outline of Suggested Content

➤ Trip planning principles

- A. Definition.
- B. Type of trip.
- C. Using a map or road atlas.
- D. Estimating.
 - 1. Time requirements of trip.
 - 2. Fuel usage and purchase.
 - 3. Amount of money needed.
- E. Driver related factors.
- F. Vehicle related factors.
- G. Cargo related factors.
- H. Weather related factors.

➤ Route planning principles

- A. Federal highway system.
 - 1. National Truck Network
 - 2. Federal Motor Carrier Safety Regulations.
 - 3. Permits and authorities.
 - 4. Definition of **STAA** vehicles.
 - 5. Size and weight limitations.
 - 6. Reasonable Access rule.

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B. State and local public roads.

1. State and local public regulations.
2. Permits and authorities.
3. State reciprocity agreements.
4. Ports of entry.
5. Portable and fixed scale houses.
6. Size and weight limitations.
7. Truck specific speed limitations.
8. Local access.
 - a. Staging areas,
 - b. Access Zones.
 - c. Designated access highways.

➤ **Hazardous materials**

- A. Federal regulations.
- B. State and local restrictions.

➤ **Record keeping and trip records**

- A. Reports driver must maintain.
- B. Freight documentation and related reports.
- C. Trip records and related expense reports.
- D. Tachograph, trip recorders and other monitoring devices.

➤ **Communications**

- A. Telephone.
- B. Satellite.
- C. Publications.
- D. Newsletters.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Plan a route from one point to another that optimizes travel time, fuel cost, potential hazards, and federal, state and local travel restrictions.
- Arrange to secure permits required by nature of the vehicle, its cargo, and routes of travel.
- Arrange for a secure place for the vehicle on layovers, especially when transporting hazardous material.

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 The types of vehicles, cargoes and routes requiring special permits.
- State requirements and the procedures for obtaining permits.
- State requirements and the procedures for ports of entry.
- 0 Map or road atlas symbols, legends and mileage charts.
- 0 How to use the Federal Motor Carrier Safety Regulations Handbook to ascertain regulations applicable to trip.
- The driver's responsibilities when hauling hazardous materials.
- The procedures for route planning. This is to include preparing paperwork, route selection and estimating time, fuel, money and personal needs to complete the trip successfully.
- 0 State and local restrictions on vehicle size and weight.

SKILL OBJECTIVES

THE DRIVER MUST:

- Read and interpret maps or road atlases.
- 0 Estimate travel time, and plan meal stops, rest stops and layovers.
- 0 Estimate mileage, fuel consumption and plan fuel stops.
- 0 Estimate expenses and arrange for sufficient funds or method of payment.

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ATTITUDE OBJECTIVES

The driver must believe:

- Federal Motor Carrier Safety regulations are for the good of everyone.
- State and local restrictions on size and weight are important safety issues.
- Hazardous material regulations protect the common good.
- Effective route planning is essential.
- Failure to obtain necessary permits, stickers, etc. can result in extensive delays and/or fines.

Major supporting concepts

- 0 Drivers who operate MTCVs need to be informed about the designated routes off the interstate system. Most companies give drivers specific routes to follow for each dispatch. A few companies give information on all routes that can be used or give primary routes with certain options
- 0 Among the routes or roads that MTCV drivers may need to be concerned about are: specific trip routes; optional trip routes; authorized routes; state selected access roads; routes between designated route systems; detours; and unusable or impaired routes. Further, it can not be assumed that drivers are familiar with designated routes including the federal and state listings.
- 0 There are routes that cannot be used because they contain bridges that fail to meet the state's load capacity criteria. There are also routes that may be impaired, that is, may be unsafe or degrade traffic operations (e.g., congested urban routes).
- 0 Route problems include narrow roads especially in the mountains; sharp turns or cutoffs; intersections with merging traffic; and adverse weather. Other problems included narrow roads to terminals; and restricted access to terminals.
- 0 States that permit LCVs provide several ways to keep them off highways that cannot accommodate them. The most common method is to construct large truck parking or exchange lots at intervals on turnpikes and Interstate highways. Carriers that use triples or lung doubles use these lots as assembly and break up points for LCVs. Tractors haul twins or single trailers from origins off the Interstate to the lot where the trailers are hitched in tandem to a single tractor for the lung haul to a destination lot. There the trailers are broken apart and either hitched to another tandem for a further leg or attached to an individual tractor and hauled to the final destination.

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- Local access: The following are among the approaches used to provide access for LCVs to and from designated highways:
 - Staging areas: Turnpikes which allow longer combinations generally have staging areas on or adjacent to the right-of-way so that trucks can be broken into shorter combinations. The truck operator either stations a second tractor nearby to transport the extra trailer beyond the designated route, or the extra trailer is left at the staging area until the original tractor can return for it.
 - Access zones: When the nationwide network for the shorter Western Doubles or twins was mandated by the STAA of 1982, the states were required to provide for "reasonable access". Most states responded by allowing twins to travel within a specified distance of the network, subject to various restrictions. Local access ranged from less than a mile to practically the entire state.
 - Designated access highways: Some states allow carriers to use specific highway segments that can accommodate particular vehicles.
- Reasonable Access: The FHWA issued a final rule on June 1, 1990 that amends "reasonable access for commercial motor vehicles with lengths and widths authorized by the Surface Transportation Assistance Act of 1982". The access rule:
 - Defines "terminal" as a location where freight originates, terminates or is handled in the transportation process or where carriers have operating facilities;
 - Prohibits states from restricting access within one mile from the National Truck Network, except for specific safety reasons on individual routes;
 - States that states that allow specific vehicles access on an individual route must provide access on that route to all vehicles of the same type. Distinction between vehicle types must only be based on significant differences in their operating characteristics;
 - Prohibits blanket restrictions on 102 inch wide vehicles;
 - Vehicle dimension limits shall not be more restrictive than federal requirements;
 - All states must have an access review process, except those with laws authorizing the operation of STAA dimensioned vehicles on all public roads and highways.;
 - States without FHWA approved access provisions in effect by June 1, 1991, must follow the requirements stated in the final rule.

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- **National Truck Network:** The National Network for trucks was established by the Surface Transportation Assistance Act (STAA) of 1982. The network allows the operation of truck tractor and 48-foot trailer combinations and truck tractor and 28-foot twin trailer combinations that are 102 inches wide with no overall length limitations. A number of States have designated a significant amount of additional mileage on the Federal-Aid Primary (FAP) System and on other routes. The Network includes almost all of the Interstate System.
 - The National Truck Network is defined in the code of Federal Regulations in 23 CFR 658.5(f). The NTN includes the Interstate System, with minor exceptions, and selected non-Interstate routes.
 - The Network allows the operation of truck-tractor and 28-foot twin (double) trailer combinations up to 102 inches wide, with no overall length limitations.
 - The National Truck Network includes nearly all of the 44,800 mile Interstate highway system and about ~52,000 miles of non-Interstate mileage. The amount of non-interstate mileage placed on the truck network varies dramatically among the 50 states, from less than 10 percent in 11 states to over 95 percent in 18 states. Of these 18 states, 13 are states allowing LCVs.
 - The 1991 ISTEA restricts the operation of longer combination vehicles on the Interstate system and commercial motor vehicle combinations with two or more cargo-carrying units on the National Truck Network to the types of vehicles in use on or before June 1, 1991, subject to whatever state rules, regulations, or restrictions were in effect on that date.
 - The ISTEA freeze does not apply to non-NTN highways. The decision whether to continue allowing the larger vehicles (on non-NTN highways) would be a matter for state or local determination.

MATERIALS

Classroom instruction must be supported by transparencies or individual class handouts including maps for route planning, copies of the Federal Motor Carrier Safety Regulations & Hazardous Materials Safety Regulations, illustrative samples of permits, copies of various state size and weight regulations and port of entry requirements.

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5.2 Cargo and Weight Consideration

Purpose

This unit provides classroom instruction on the importance of proper cargo documentation, loading, securing and unloading cargo, weight distribution, load sequencing and trailer placement. Emphasis is placed on the importance of axle weight distribution, trailer placement and its effect on vehicle handling.

Outline of Suggested Content

➤ Cargo documentation

- A. Definition, responsibilities and forms.
 - 1. Bills of Lading.
 - 2. Freight bill or pro.
 - 3. Cargo manifest.
 - 4. Interline freight.
 - 5. Other documentation.
- B. Pickup and delivery procedures.
 - 1. Driver's responsibilities.
 - 2. Loading and unloading.
 - 3. Special services and/or procedures.
- C. Hazardous materials.
 - 1. Documentation and placarding.
 - 2. Driver's responsibilities.
 - a. At time of pickup.
 - b. In transit.
 - c. At time of delivery.
 - 3. Special situations.

➤ Loading, securing and unloading

- A. Federal Motor Carrier Safety regulations.
 - 1. Overview.
 - 2. Driver's responsibilities.

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- B. Loading and blocking techniques.
- C. Consequences of improperly securing cargo.
- D. Sealed or containerized loads.
- E. Specialized cargo.

➤ **Weight distribution and center of gravity**

- A. Importance of uniform weight distribution.
 - 1. Loading, blocking and weight distribution techniques.
 - 2. Unloading techniques and weight redistribution.
 - 3. Consequences of poor weight distribution.
- B. Overweight definitions.
- C. Definition of center of gravity.
- D. Effect of high / low center of gravity on:
 - 1. Handling characteristics.
 - 2. Trailer stability,
 - 3. Turning or cornering ability.
 - 4. Rearward amplification.
 - 5. Rollover.

➤ **Load sequencing and trailer placement**

- A. Importance of uniform weight distribution among axles.
- B. State Regulations.
 - 1. Usually heavier trailer first if both trailers are of equal length,
 - 2. Weight differential for trailer placement varies by state.
 - 3. Considerations for width and height,
- C. Discussion on brake induced instability.

➤ **Drive train considerations**

- A. Sufficient torque, horsepower & drivetrain efficiency to:
 - 1. Compensate for added weight and wind resistance.
 - 2. Accelerate, climb hills, merge with traffic etc.
 - 3. Reduce excessive speed differentials with other traffic.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Verify nature, amount, and condition of cargo at time of pickup and/or delivery.
- Verify information on bill of lading and properly issue bill of lading to shipper.
- Load and unload cargo safely and efficiently.
- Ensure that the weight and distribution of the load meet legal and safety requirements.
- Secure, block and/or brace load properly.
- Ensure proper load sequencing and trailer placement to meet legal and safety requirements.
- Properly complete all required paperwork, complying with all Federal Motor Carrier requirements dealing with cargo handling, documentation, record keeping and placarding .

KNOWLEDGE OBJECTIVES

Driver must know:

- The procedures for properly completing all required paperwork.
- The procedures for complying with all Federal Motor Carrier Safety Regulations requirements on cargo handling, documentation, record keeping and placarding.
- The drivers responsibilities when hauling hazardous materials.
- The procedures for loading and unloading.
- The procedures for securing cargo, including methods of blocking, bracing, packing, stacking, and the use of straps, rope, cable, chains, and chain binders.
- The nature, function, and operation of common cargo handling equipment, including pallets, jacks, dollies, handtrucks, forklift trucks, nets, slings, rug poles, and other equipment.
- Federal and state regulations on loading, weight limits, weight distribution, load sequencing and trailer placement.
- Factors affecting brake induced instability.

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SKILL OBJECTIVES

THE DRIVER MUST:

- Be able to perform basic mathematical calculations to conduct accurate cargo count.
- Be able to perform basic mathematical calculations to ascertain accurate weight of the cargo and gross vehicle weight.

ATTITUDE OBJECTIVES

The driver must believe:

- The proper completion of cargo documentation is important to the prevention of theft, claims and compliance with the law,
- That the proper handling and securing of cargo is necessary for the protection of the cargo, the vehicle, the driver and other road users.
- Federal, state and local restrictions on size, weight and trailer placement are important safety issues.
- Hazardous material documentation must be properly completed for public health, safety and for compliance with the law.
- That penalties for noncompliance with hazardous material regulations can be very severe for both the driver and his / her employer.

Major supporting concepts

- MTCVs typically weigh more than the tractor-semitrailers they replace. They can carry higher average payloads and they weigh more when empty.
- A maximum weight of 20,000 lbs. per single axle is permitted on the Interstate Highway System. This limit was set to fall within the load design of the interstate system,
- MTCV fleets have managed speeds. Speed is the source of bridge damage, not weight per se: a heavily-laden trailer crossing an interstate highway bridge at 55 mph is far less damaging to the bridge than the same trailer at 70 mph.
- Most highway engineers agree, and empirical data strongly supports, that highway pavement damage is more a factor of axle loads than gross vehicle weight (GVW).
- When a vehicle undergoes a turn, it experiences a centrifugal force pulling outward from the center of the turn through the vehicle's center of gravity. This force tends to roll the vehicle outward from the turn, and if large enough, will cause the vehicle's inside tires to lift from the ground and roll the vehicle over.

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- 0 In articulated vehicles, rollover in the **rearmost** trailer is promoted by high centers of gravity, narrow wheel tracks, and inadequate roadway superelevation -- in addition to excessive speeds and sharp turns.
- 0 Rearward amplification can cause an exaggerated motion of the last trailer (of a MTCV combination), and could cause a rollover of the last trailer if the last trailer has a high center of gravity.
- 0 Since the weight of each trailer affects stability, trailer sequencing is of special importance.
- 0 For safe handling on the road, the more heavily loaded MTCV should be in the front position.
- 0 The weight differential at which one trailer becomes "lighter" than another varies among states.
- 0 Sequencing restrictions may be contradictory especially with trailers of unequal lengths. In one state (Nevada), if a combination consists of a heavier, shorter trailer and a longer, lighter trailer, the longer trailer must be placed behind the shorter trailer
- 0 The reason for requiring trailer sequencing stems from brake-induced instability. A lightly loaded trailer when used in combination with a more heavily loaded one, is likely to experience wheel lockup under heavy braking before the more heavily loaded trailer. If the light load is in the first trailer, this could lead to a tractor jackknife or buckling of the entire combination unit vehicle in its middle section. If the light load is at the rear of the combination and locks up, it may experience trailer swing, which is more amenable to recovery than jackknifing.
- 0 MTCV operators must make allowances for decreased acceleration and increased passing time attributable to increased weight and wind resistance.
- 0 Because of **LCVs** generally weigh more than 80,000 pounds and are longer than single-trailer trucks, the ability of these combinations to move compatibility with traffic has been a concern. In moving traffic, **LCVs** must have sufficient horsepower, engine torque, and drive train efficiency to climb hills, pass other vehicles, and merge with traffic without creating excessive speed differentials between themselves and other vehicles.

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on cargo documentation, cargo handling , loading & unloading procedures and principles of weight distribution.

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5.3 Public Relations And Safety

Purpose

This unit provides classroom instruction on the importance of professionalism , maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

Outline of Suggested Content

➤ The image **of the trucking industry**

- A. From the government sector.
- B. From the public's perspective.
- C. From the trucking company perspective.
- D. From the driver's perspective.

➤ **Contact** with the public

- A. Safe driving principles and good image.
 - 1. Following the law.
 - 2. Following Safe Operating Practices
 - 3. Sharing the road.
 - 4. Being courteous and helpful.
- B. Good appearance and attitude.
 - 1. Both on & off duty.
 - 2. Show respect, courtesy and understanding.
 - 3. Rendering assistance.
 - 4. Standing up for the industry with dignity and understanding.
 - 5. Be proud to be a professional driver.

➤ **Customer relations**

- A. A driver is his / her company's visible contact with the customer.
- B. Drivers can sell themselves and their company.
- C. Follow the rules, both your company's and the customer's.
- D. Have a positive attitude, it will get you where you want to go.

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➤ **Employer relations**

- A. Know your basic job requirements.
- B. Comply with the Federal Motor Carrier Safety Regulations requirements.
- C. Follow company policies and procedures.
- D. Always display a professional attitude.

➤ **Safety concerns**

- A. Special hazards to MTCVs on the road.
 - 1. Steep grades.
 - 2. Sharp curves.
 - 3. Narrow lanes & shoulders, etc.
- B. Handling characteristics.
 - 1. Rearward amplification.
 - 2. High speed off-tracking.
 - 3. Impaired sensory feedback to the driver.
- C. How to compensate.
 - 1. Increase knowledge through training.
 - 2. Increase driving skill through training.
 - 3. Incorporate Safe Operating Practices into driving habits.
 - 4. Always display a professional attitude while driving.

➤ **Future of MTCVs in trucking**

- A. Population growth rate.
- B. Increased density of people and traffic.
- C. Shortage of well trained, experienced drivers.
- D. A Career for a Professional!

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Maintain a neat personal appearance on and off duty.
- 0 Interact tactfully with customers and the general public,
- 0 Lend assistance to other motorists when permitted.
- 0 Be courteous to other drivers by following the principles of sharing the road.
- 0 Incorporate Safe Operating Practice driving principles into driving habits.
- 0 Always display a professional attitude, even in the face of adversity.
- 0 Compensate for the special handling characteristics and unique road hazards peculiar to MTCVs.

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 The impact the driver has on the image of his / her company and the trucking industry.
- 0 How to show respect, courtesy and understanding.
- 0 The direct and indirect effects of unsafe and discourteous acts upon the public's image of his / her employer and the trucking industry.
- 0 The rules of the company and the customer,
- 0 The proper procedures for handling complaints from the general public or customers.
- 0 The particular handling characteristics of MTCVs and know how to compensate for them.

ATTITUDE OBJECTIVES

The driver must believe:

- 0 That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- 0 That obeying traffic laws will not only reduce the risks of having an accident but will enhance the image of the professional driver.
- 0 That company and customer rules and regulations are important and should be followed.
- 0 That courtesy on the highway is important, improves the image of the company and the industry and is a good safety principle to follow.

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- Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- That it is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- That a professional driver is always in control of his / her vehicle and emotions.
- Improper use of the horn, signals, and the cb is potentially dangerous and will tarnish the image of the professional driver.
- That a professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.

Major supporting concepts

- More impressive than their efficiency is the safety record of the longer combination vehicles. State and toll road authorities and individual carriers report that LCV configurations have markedly superior safety records measured against miles traveled compared to those of any other kind of truck configuration. A March 1992 study report from the U.S. General Accounting Office examined in detail previous LCV safety studies, state reports, and data from motor carriers operating **LCVs**. The preponderance of that evidence showed that, indeed, the LCV was far and away the safest truck configuration on the road. Unfortunately, the poor quality of most state accident reports regarding **LCVs** and the lack of exposure information by highway and LCV configuration type does not permit a precise quantification of that safety benefit. But it is there -- an "unknown" quantity, as reported by GAO. Illustrative of that record is the fact that over the last 10 years there have been only nine fatalities resulting from triples operations in hundreds of million of miles of travel.
- This 25 year record of high-standard safety certainly reflects all of the special engineering, testing, driver training, rigorous permit regulations, routing, weather limitations, and other requirements that govern LCV operations.
- The excellent safety record enjoyed by LCV operators over the past three decades has been due in large part to the fact that they must qualify for special divisible load permits and operate under a set of strict rules and regulations. These permits and rules are over and above those which are required of standard tractor-semis and doubles in regular operation.
- Most studies of LCV safety have found Turnpike Doubles and Rocky Mountain Doubles to have accident rates as low or lower than rates for conventional tractor-semitrailer combinations operating on the same or similar highways.
- In the only study that reported tests on longer combinations on congested urban freeways, California researchers found that Turnpike Doubles, Rocky Mountain Doubles, and triples all operated satisfactorily. A large measure of their successful performance, however, was attributed to the drivers and their

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skill in foreseeing and avoiding potential traffic conflicts. When conflicts did occur, the interference and accident potential they created were substantially greater than would have been created by other vehicles.

- 0 The low accident rate of Turnpike doubles, reported in a study by University of Michigan researchers, concluded that the low accident rate "may result from the driver's expertise rather than some property of the vehicle".
- 0 An ATA Foundation (Trucking Research Institute) report (1990) said that the safer record of LCVs is partly due to superior equipment and inherent performance capabilities of the configurations. These factors include greater stability of longer cargo units and better braking capability with more axles and lighter axle loads. They also include better quality equipment and better maintenance.
- 0 Professionalism is expressed as an attitude that marks the difference between the true professional driver and a would be pretender.
- 0 Professionalism is the practice of safe, courteous and responsible behavior, at all times, on and off the highway.
- 0 Every driver, professional or not, is an ambassador carrying a message to the public about truck safety and driving professionalism.
- 0 Ultimately, the attitude and behavior of driving professionals will determine the public's perception of truck safety and truck drivers.
- 0 Motor carriers and drivers ultimately must be the ones who decide that professional driving behavior is the only acceptable way to operate heavy trucks. This can be accomplished, on the part of motor carriers, by continuous efforts to qualify, hire, and train only the best, most professional people to operate their trucks, this coupled with consistent driver supervision and reasonable trip scheduling. For drivers, it involves adherence to the principles of professionalism, good judgement, common sense and courtesy.
- 0 Due to the size of the MTCV vehicle, the driver must exercise extra caution, courtesy and consideration for other motorists and pedestrians.
- 0 Public awareness of truck safety and media attention to the topic are intense. Many people perceive current truck safety problems as the consequence of trends toward more and larger trucks.
- 0 The actions of the vehicle driver probably have a greater influence on an accident occurrence than any other factor.
- 0 The growth in the use of MTCVs has not increased highway accident losses, but MTCVs do have certain handling characteristics that pose a risk in some circumstances. The characteristics may be summarized as:
 - o Rearward amplification.
 - o High speed off-tracking.
 - o Impaired sensory feedback to the driver.

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- Because of these operational characteristics, drivers of **LCVs** must be well trained. To compensate for **LCVs'** operational differences and reduce the number of accidents involving **LCVs**. States allowing them have historically imposed additional controls on LCV drivers, the equipment, carriers using **LCVs**, and the vehicle's operating environment, although these controls, such as the route restrictions vary among states.
- State regulations may require that **MTCVs** have on board certain types of emergency equipment or spare parts such as triangles reflectors, fire extinguishers, light bulbs or spare fuses.
 - For example, the State of Nevada requires that every full-sized truck or truck tractor used in a combination of vehicles must carry:
 - a. One fire extinguisher which meets prescribed standards.
 - b. One spare light bulb for every electrical lighting device used on the rear of the last trailer.
 - c. One spare fuse for each different kind and size of fuse used every vehicle in a combination of vehicles.
 - d. Any flares, reflectors or red electric lanterns which meets regulations.
 - e. During the seasons when it is likely that weather conditions may require the use of tire chains, one set of chains for each wheel to which power is applied. Note: See section 3.4 for chaining considerations
- Two key factors that could impact the future safety of **LCVs** are projections for an increase in traffic density and a shortage of experienced truck drivers. DOT projects tremendous growth in traffic over the next 30 years, indicating that the number of vehicle miles traveled will nearly double by 2020. Intercity trucking has grown rapidly during the **1980s**, and truck travel is projected to account for a larger share of the total miles traveled by all vehicles in the future. Although traffic density in the Western states is and will probably be lower than in the rest of the country, **LCVs** in the West are likely to encounter heavier traffic than they do today.
- A chief concern of the trucking industry is a shortage of well-trained and experienced drivers. A Department of Labor's estimate indicate that trucking will have one of the greatest demands for workers in the future.

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on driver professionalism, the image of the trucking industry, public and employer relations, interpersonal skills, safety concerns and how to compensate.

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ADVANCED MTCV

UNIT	Section 6 Vehicle Familiarization	CLASS- ROOM	LAB	ON RANGE	ON STREET	TOTAL
6.1	Introduction / Inspection	0.5	1			1.5
6.2	Coupling And Uncoupling	0.5		1		1.5
6.3	Basic Control And Handling	0.5		1		1.5
6.4	Basic Maneuvers	0.5		2		2.5
6.5	Turning, Steering & Tracking	0.25		1		1.25
6.6	Proficiency Development	0.25		2	3	5.25
TOTAL		2.5	1	7	3	13.5

Section 7 Performance Practice

7.1	Interacting With Traffic	0.75			1.5	2.25
7.2	Speed & Space Management	0.5			2	2.5
7.3	Night Operations	0.5		1	2	3.5
7.4	Extreme Driving Conditions	0.5				0.5
7.5	Hazard Perception	0.5			1	1.5
7.6	Proficiency Development	0.25			4	4.25
TOTAL		3	0	1	10.5	14.5
SECTIONS 6 AND 7 TOTALS		5.5	1	8	13.5	28

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SECTION 6 - Vehicle Familiarization

The units in this section provides the trainee drivers an opportunity to familiarize themselves with a different MTCV vehicle. In this section the driver will apply the basic competencies he/she acquired in Section 2 to a different MTCV.

The driver trainees will review how to inspect, couple and uncouple a different MTCV, ensure the MTCV is in the proper operating condition, and control the motion of the MTCV under various road and traffic conditions.

During the range and street exercises in this section, the student will first familiarize himself/herself with basic backing principles utilizing a single trailer. The student will then become familiar with the basic operating characteristics of the MTCV. Utilizing this vehicle, the students must be able to perform the skills learned in each unit to a level of proficiency required to permit safe transition to on street driving.

Six units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS ROOM	LAB	RANGE	STREET	TOTAL HOURS
6.1	Introduction / Inspection	0.5	1			1.5
6.2	Coupling And Uncoupling	0.5		1		1.5
6.3	Basic Control And Handling	0.5		1		1.5
6.4	Basic Maneuvers	0.5		2		2.5
6.5	Turning, Steering & Tracking	0.25		1		1.25
6.6	Proficiency Development	0.25		2	3	5.25
	TOTAL HOURS	2.5	1	7	3	13.5

HOURS OF BEHIND THE WHEEL DRIVER TRAINING		RANGE HR'S B-T-W		STREET HR'S B-T-W	TOTAL HOURS B-T-W
NUMBER OF TRAILERS USED ➤		1	2	2	
UNIT					
6.2	Coupling And Uncoupling	0.5	0.5		1
6.3	Basic Control And Handling		1		1
6.4	Basic Maneuvers	0.5	1.5		2
6.5	Turning, Steering & Tracking		1		1
6.6	Proficiency Development		2	3	5
	TOTAL HOURS	1	6	3	10

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6.1 Introduction / Inspection

Purpose

This unit serves as an orientation to the course and provides instruction on the systematic vehicle inspection of MTCV tractor trailers. This is to include pre-trip, en-route, and post-trip inspection procedures. While vehicle inspections are common in all commercial motor vehicle operations, some factors are peculiar to MTCVs. Emphasis is placed on component failure recognition. Most of the instruction is to take place in a lab setting with the vehicle.

Outline of Suggested Content

➤ Introduction

- A. Rules of conduct and safety.
- B. Course schedule and instructional unit outline.
- C. Course objectives and methods of evaluation.
- D. Requirements for completion of course.

➤ Professional driver

- A. Follow the law.
- B. Maintain a professional appearance.
- C. Maintaining a positive attitude.
- D. Conduct on and off duty.
- E. Following company rules and regulations.
- F. Federal Motor Carrier Safety Requirements.
- G. Basic job requirements.

➤ Review of vehicle pre-trip, enroute and post-trip inspection procedures

- A. Details of a good inspection.
- B. Federal requirements.
- C. Inspection procedures.

➤ Additional procedures for reporting

- A. Equipment lost, stolen, defective.
- B. Malfunctions or physical damage to tractor, trailers or dollies.

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C. Additional Company rules, policies, procedures.

➤ What to check out when inspecting tractor, trailers and converter dollies

A. Review CHECKLIST: VEHICLE SAFETY INSPECTION

➤ Vehicle walk around sequence

A. Introduction.

B. Methodology.

C. Steps to follow.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Inspect and determine the condition of critical combination vehicle components, including instruments and controls; engine and drive train; chassis and suspension; steering system; air brake system; converter dollies; coupling systems; emergency equipment; and cargo securement devices.
- Perform pre-trip inspections on MTCVs in a regular, systematic sequence that is accurate uniform and time efficient.
- Perform **enroute** inspections by monitoring instruments and checking mirrors for signs of trouble; making periodic roadside inspections of critical components; and meeting **enroute** requirements for transporting hazardous materials.
 - While listening and feeling for indications of malfunctions is a normal part of performing **enroute** inspections, the driver of MTCVs must be cautious to the fact sensory feedback is more seriously impaired when driving MTCVs than for tractor semitrailers.
- Perform post-trip inspection by making accurate notes of actual and suspected component abnormalities or malfunctions.

KNOWLEDGE OBJECTIVES

Driver must know:

- Course objectives and expectations.
- Rules of conduct and safety while in training.
- Methods of evaluating performance and standards to be met.
- Minimum requirements for completion of course.
- Company rules and regulations.

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- Basic job and FMCSR requirements.
- The impact the driver has on the image of his / her company and the industry.
- Procedures for pre-trip, enroute, and post-trip vehicle inspection procedures.
- A systematic process to assure a rapid and complete inspection.
- The effect of undiscovered malfunctions upon safety, effectiveness and economy.
- The importance of correcting malfunctions quickly before they pose a hazard to the driver or other road users.
- Federal, state, and other regulations governing vehicle inspections, including special regulations for hazardous materials cargo.

ATTITUDE OBJECTIVES

The driver must believe:

- That obeying traffic laws will not only reduce the risks of having an accident but will enhance the image of the professional driver,
- That company rules and government regulations are important and should be followed.
- That it is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- That a professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.
- It is the drivers obligation to insure that the vehicle is in safe operating condition before taking it out on the road and to cease operating it if an unsafe condition is discovered.
- The consequence of breakdowns and accidents justify the time spent on the vehicle inspections.

Major supporting concepts

- Refer to instructional unit 2.1

MATERIALS

Classroom instruction must be supported by printed or visual materials that describe common malfunctions and the frequency with which they are encountered,

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or vehicle safety inspection criteria work sheet,

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CHECKLIST: VEHICLE SAFETY INSPECTION

A. EXTERIOR LIGHTS

1. Demonstrates high and low beam headlights, signals, brake lights, emergency flashers and clearance lights.

PASS FAIL

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B. HORNS

1. Demonstrates horn works properly. (air & electric)

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C. SPLASH GUARDS

1. Demonstrates splash guards are present, firmly attached and are not damaged.

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D. FLUID LEVELS & LEAKS

1. Demonstrates method of checking fluid levels. This includes radiator, motor oil, transmission fluid (if accessible), and power steering fluid.
2. Checks for Fluid Leaks.

E. BELTS AND HOSES

1. Identifies and checks condition of belts and hoses.
This is to include but not limited to: (Circle item missed)

Belts

alternator
air compressor
fan / water pump
air conditioner

Hoses

power steering
water & radiator
smog pump
fuel

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F. STEERING SYSTEM

1. Identifies and checks condition of steering gear box, pitman arm, steering knuckle arm, lower control arm and tie rod ends.

--	--

G. TIRES, WHEELS, LUGS, RIMS

1. Checks tires for same height, width, type, excessive / unusual tread wear, bumps, cuts, duals not touching, objects between duals, etc.
2. Checks wheels / rims for cracks, welds, bent rims or other damage.
3. Checks all lugs are present and tight. Looks for rust around lugs.
4. Checks hub odometer for damage.

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H. SPRINGS AND SHOCK ABSORBERS

1. Checks springs, for missing or broken leaves or poor alignment.
* Air ride bellows not leaking, properly inflated.
Height control arm not bent, operating properly,
2. Check for loose or broken U-bolts, spring hangers or shackles.
3. Checks for loose, broken or leaking shocks.

PASS FAIL

I. BRAKES, DRUMS, LININGS

1. Checks condition of brakes including linings and drums for excessive or unusual wear or damage.
2. Checks push rods and slack adjusters for proper adjustment.

J. AXLE SEALS

1. Checks axle seals for exterior cracks or leakage around wheel hubs.

--	--

K. DOORS AND MIRRORS

1. Checks that passenger & cargo doors operate OK, hinges are functional & doors are secure.
2. Checks mirrors for proper mounting, adjustment, damage, and visibility.
3. Grab handles secure, no loose or missing bolts.

L. EMERGENCY REFLECTORS

1. Identifies locations of reflectors. All are in fully serviceable condition. (three required)

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M. FUEL TANKS & BATTERY BOX

1. Checks that tanks are not damaged and are secure, cap gasket is in place, caps are tight and there is no leakage.
2. Checks crossover line for leaks
3. Checks battery box mounting, & cover. Batteries secured against movement, cases not damaged or leaking. Fluid in batteries at proper level, cell caps secure.

N. AIR | ELECTRICAL LINES AND CONNECTORS

1. Checks air / electrical lines for damage and/or leaks.
2. Checks that connectors are in good condition and firmly attached.

DRAFT

O. FIFTH WHEEL ASSEMBLY (TRACTOR & DOLLY)

PASS FAIL

1. Identifies the following parts:

- a. King pin,
- b. Locking pin,
- c. Safety latch,
- d. Release handle.

2. Checks that fifth wheel assembly does not have broken or damaged parts, that assembly is firmly attached to tractor or dolly, and that trailer is firmly attached to the fifth wheel.

P. LANDING GEAR / SLIDING TANDEM

1. Checks that landing gear is fully raised, has no missing or damaged parts and handle is secured.
2. Sliding tandem is locked & has no visible damage, worn or missing parts. Flexible air lines not cracked, crimped or otherwise damaged. Lines are secured against tangling, dragging, etc.

Q. BRAKE SYSTEM

1. Air compressor cuts in a 85 PSI. Minimum.
2. Air compressor cuts out at 125 PSI max.
(Acceptable cut out range 110 to 125 PSI)
3. **Static** pressure loss no greater than 3 PSI for a combination vehicle. (2 PSI single vehicle)
4. **Applied** pressure loss no greater than 4 PSI for a combination vehicle. (3 PSI single vehicle)
5. Low pressure warning device (light or alarm) activates at 50% maximum governed air pressure (on or before 60 PSI).
6. Emergency / parking system operates properly.
Emergency brake sets up between 20 and 45 PSI.
7. Pull test tractor park brake .
8. Rolling brake test complete system.

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R. GAUGES (OTHER THAN AIR)

Identifies and explains the following gauge / readings

1. Oil Pressure
2. Fuel
3. Temperature
4. Ammeter/Voltmeter
5. Speedometer
6. Tachometer
7. Brake application
8. _____

PASS FAIL

S. HEATER / DEFROSTER

1. Identifies and activates heater / defroster.

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T. WINDSHIELD, WIPERS AND WINDOWS

1. Windows free of any condition which obstructs view of driver or passenger.
2. Wipers function properly.

U. PANEL LIGHTS / INSPECTION STICKER

1. Identifies indicator lights on instrument panel.
2. Identifies and explains the purpose for inspection sticker.

V. STEERING WHEEL

1. Steering wheel play not in excess of 10 degrees.

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W. FIRE EXTINGUISHER

1. Secure in holder.
2. Inspection plate. Classification _____
3. Pressure gauge works. (charged)
4. Wire / plastic seal unbroken.
5. Pin secured. (if applicable)
6. Inspection tag dated within 12 months

TOTALS:

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FINAL SCORE:

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6.2 Coupling and Uncoupling

Purpose

This unit provides a review on the procedures for coupling and uncoupling MTCVs. While vehicle coupling and uncoupling procedures are common in all tractor semi-trailer operations, some factors are peculiar to MTCVs. Emphasis is placed on pre-planning and safe operating procedures. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ Staging of equipment

- A. Locate equipment to be coupled.
- B. Pre-plan location to perform coupling sequence.
- C. Confirm adequacy of location to assure sufficient room for safe maneuvering.
- D. Inspect equipment for readiness.

➤ Coupling routine review

- A. Maneuver.
- B. Inspect for readiness.
- C. Hook first trailer.
- D. Inspect & test coupling.
- E. Maneuver.
- F. Inspect for readiness.
- G. Hook converter dolly.
- H. Hook second trailer.
- I. Inspect / test coupling of tractor-trailer-dolly-trailer unit.
- J. Repeat if coupling triples.

➤ Summary of safety concerns

- A. Load sequencing and trailer placement.
- B. Proper procedures reduce the likelihood of accidents occurring.
- C. Examples of accidents caused by improper coupling or uncoupling.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Align the tractor properly to connect with the trailer.
- Secure the trailer against movement.
- Back the tractor properly into the trailer kingpin without damage.
- Align the tractor and trailer properly to connect with the dully and trailer.
- Properly connect the converter dolly to the lead trailer.
- Connect electrical and air lines properly.
- Back the converter dully into the rear trailer kingpin without damage.
- Perform mechanical and visual checks to make sure couplings are secure.
- Set in-cab air brake controls properly.
- Retract and secure landing gears after couplings are secure.

KNOWLEDGE OBJECTIVES

Driver must know:

- The name, location and function of each of the primary controls, instruments and gauges required fur coupling and uncoupling MTCVs.
- The name, location and function of all of the hitching mechanisms and their associated components required to couple and uncouple MTCVs. This is to include fifth wheels kingpins, converter dollies, jifflox, drawbar, pintle hook, etc.
- The name, location and function of all of the air brake and electrical components required to couple and uncouple MTCVs. This is to include trailer hand valve, air tanks, air lines electrical lines shutoff valves etc.
- The order, sequence and direction of vehicle manipulations and movements required to properly position the tractor, lead (first) trailer, converter dolly, and rear (second) trailer fur a safe and successful coupling and uncoupling.
- The procedures fur pulling various converter dollies safely.
- The hazards of improper coupling and uncoupling.

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SKILL OBJECTIVES

Driver must:

- Align the units, tractor, **first (lead)** trailer, dolly, second (rear) trailer.
- Back the trailer to achieve sufficient force to lunk the fifth wheel on the tractor **and/or** converter dolly to the kingpin on the first (lead) and second (rear) trailer without damaging the kingpin.
- Pull against the kingpins to check the connections without abusing the equipment.

ATTITUDE OBJECTIVES

The driver must believe:

- Following proper coupling and uncoupling procedures is important and will reduce the likelihood of injury or accidents.
- Careless coupling and uncoupling is very dangerous.
- That accidents caused by improper coupling and uncoupling are always preventable.

Major supporting concepts

- Refer to instructional unit 2.2

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that demonstrate coupling and uncoupling MTCVs. Also required are printed **or** visual materials that describe common hazards associated to coupling and uncoupling MTCVs and the consequences of improper procedures.

On range instruction must be supported by materials **or** equipment that permit instructor and observer critique, such as an observer checklist and **or** coupling and uncoupling criteria work sheet.

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6.3 Basic Control and Handling

Purpose

This unit provides a review of basic vehicular control and handling as it applies to a specific MTCV. This is to include instruction on brake performance, handling characteristics and factors affecting MTCV stability while braking, turning and cornering. Emphasis is placed on safe operating procedures. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

- **Braking performance is a function of stopping distance and vehicle controllability.**
 - A. Stopping distance is influenced by a number of factors to include:
 1. Friction available between tires and pavement.
 2. Brake system characteristics.
 3. Distribution of weight on individual axles.
 - B. Vehicle controllability during brake application is influenced by:
 1. The number of axles, articulation points and brake balance between units.
 2. The ability to maintain directional control and avoid wheel lock up.
 3. The probability that the wheels on one or more axles may lock up.
- **Vehicle characteristics**
 - A. LCV's have different handling characteristics than semi's
 - B. Every vehicle has its own handling and performance characteristics.
 - C. Combining and or exchanging units changes the handling characteristics of the combined vehicle.
 - D. Empty MTCVs are inherently less stable than loaded MTCVs.
- **Handling and stability characteristics**
 - A. Are affected by:
 1. Height of the center of gravity of the cargo being carried.
 2. The distribution of the cargo within the trailers.
 3. The type of coupling devices used.

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4. Road and weather conditions.

B. The handling and stability characteristics must related to safety that are influenced by truck weight, size, and articulation are:

1. Off-tracking.
2. Response to rapid steering.
3. Sensory feedback.
4. Braking.
5. Oscillatory sway.
6. Yaw stability and rollover in steady turns.

➤ **Summary of safety concerns**

A. Proper procedures reduce the likelihood of accidents occurring.

B. Impaired sensory feedback to the driver.

1. Greater number of trailer couplings in **MTCVs**.
2. Increased overall flexibility of unit.

C. Examples of accidents caused by improper procedures.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Perform mechanical and visual checks to make sure coupling is secure.
- Start, warm up and shut down the engine, according to manufacturer's specifications.
- Properly secure himself/herself in the seat using the lap / shoulder belt prior to putting the vehicle into motion.
- Put the vehicle in motion, and accelerate smoothly using double clutching technique.
- Select proper gear for speed and road conditions.
- Bring the vehicle to a smooth stop minimizing any vehicle instabilities.
- Maintain directional control and minimize any vehicular instabilities while making maneuvers.

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KNOWLEDGE OBJECTIVES

Driver must know:

- The name, location and function of each of the primary controls, instruments and gauges required for coupling and uncoupling MTCVs.
- The name, location and function all of the air brake and electrical components required to couple and uncouple MTCVs. This is to include trailer hand valve, air tanks, air lines, electrical lines, shutoff valves etc.
- The shifting pattern, procedures, instruments and controls necessary to shift gears properly.
- The manufacturer's specifications for engine operation.
- The procedures for carrying out the performance objectives.
- The relationship of wheel base length, articulation, and the number of axles to path of a turn.
- The factors which affect vehicular stability and handling.
- The handling and stability characteristics must related to safety that are influenced by truck weight, size, articulation and road conditions.

SKILL OBJECTIVES

Driver must:

- Coordinate use of accelerator and clutch (double clutching technique) to achieve smooth acceleration and avoid clutch abuse.
- Properly modulate air brakes to bring vehicle to a smooth stop with no visible signs of instabilities.
- Adequately judge the stopping distance of unit while in the process of bringing the vehicle to a smooth stop.
- Coordinate steering, braking and acceleration to take the vehicle through a desired path of travel with no visible signs of instabilities.

ATTITUDE OBJECTIVES

The driver must believe:

- That use of the lap / shoulder belt will increase his / her safety and the safety of other road users
- That following correct starting, warm-up, braking, turning and cornering procedures is essential to safe and economical vehicle operation.

Major supporting concepts

- Refer to instructional unit 2.2

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MATERIALS

Classroom instruction must be supported by printed or visual materials that describe common hazards encountered by **MTCVs** and the consequences of improper safety procedures.

On-range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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6.4 Basic Maneuvers

Purpose

This unit provides a review on the basic vehicular maneuvers which will be encountered by MTCV drivers. This is to include instruction on backing, lane positioning and path selection, merging situations and parking MTCVs. Emphasis is placed on safe operating procedures as they apply to brake performance and directional stability while accelerating, braking, merging, cornering, turning and parking. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ **Backing**

A. Types of backing maneuvers and their application to coupling MTCV.

1. Straight line backing maneuver.
2. 45 degree alley / duck backing maneuver.
3. Jackknife backing maneuver
4. Parallel park maneuver.
5. Difference with different converter dollies.
 - a. A-dolly, single drawbar.
 - b. B-dolly, double drawbar.
 - . Nun steering capability.
 - . Wheel steering capability.
 - c. C- dolly, double drawbar with steering mechanism.
 - d. Jifflox
 - e. Other

➤ **Parking MTCVs**

- A. Always use pull through parking spaces without pull out obstruction.
- B. Always plan your exit before your park.
- C. Always apply parking brake and chock wheels unless
1. Brakes are very hot.
 - a. Then chock wheels, stop engine, put transmission in gear, and let brakes cool.
 2. Brakes are wet in freezing weather.

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- a. Then use brakes lightly before parking to heat up and dry brakes.

➤ Lane positioning and path selection

- A. Laws, rules and regulation may restrict lane usage.
- B. Select (legal) lane offering:
 - 1. Best mobility.
 - 2. Least traffic interference.
- C. Straight driving vehicle centered in lane of travel.
 - 1. Coordinate steering input to minimize **over or** under steering.
- D. Curves
 - 1. Speed adjusted for curve prior to entering curve.
 - a. **Never shift, brake or heavily decelerate in a curve.**
 - 2. Adjust position in lane prior to entering curve to allow for off-tracking.
 - a. **Never cut across a lane to straighten out a curve.**
 - 3. Hold lane position without drifting or weaving.
 - 4. Accelerate gently / steadily in curve, pulling the trailers through curve.

➤ Merging

- A. Steps for merging onto roadway or freeway from entrance.
 - 1. Check main road for traffic using window and current roadway using mirrors.
 - 2. Activate signal while in acceleration lane.
 - 3. Align the rig with roadway to observe overtaking traffic using mirrors.
 - 4. Adjust speed to as close to the highway speed as possible while in the acceleration lane.
 - a. **Do not over accelerate (speed) on ramp.**
 - 5. Enter roadway and cancel signal.
- B. Steps for merging into gaps in traffic
 - 1. Look for gap and signal intention for gap.
 - 2. Align the rig with the roadway to observe overtaking traffic using mirrors.
 - 3. Find, locate or select gap.
 - 4. Adjust speed to as close to the speed of the other traffic as possible.
 - 5. Enter gap and cancel signal.

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C. Safety concerns:

1. Ramp speed, length and superelevation.
2. Insufficient acceleration speed or lane length.
3. Insufficient gap in the traffic.
 - a. Forced to slow down.
 - b. Forced to stop.

➤ Summary of safety concerns

- A. Proper procedures reduce the likelihood of accidents occurring.
- B. The handling and stability characteristics most related to safety that are influenced by truck weight, size, and articulation are:
 1. Off-tracking.
 2. Response to rapid steering.
 3. Sensory feedback.
 4. Braking.
 5. Oscillatory sway.
 6. Rollover in steady turns.
 7. Yaw stability in steady turns.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Back tractor-semitrailer in straight line, curved paths, 45 degree angle, offset alley, and into a parallel park position.
- Use mirrors to check path and clearances while backing.
- Judge sides, rear, and overhead clearances and path of travel of the trailer.
- Selecting safe parking location, park and leave parking location safely.
- Select proper gear for speed and road conditions.
- Select the lane offering the best mobility and least traffic interference.
- Keep vehicle centered in the lane of travel without drift or weaving.
- Adjust speed to the configuration and condition of roadway.

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KNOWLEDGE OBJECTIVES

Driver must know:

- The procedures for backing and parking, lane positioning and merging.
- The correct position in which to place the vehicle before beginning backing or parking maneuver.
- The principles of reverse steering and articulated vehicles.
- The hazards of backing, the importance of avoiding unnecessary backing and the importance of checking the area prior to backing and of using a guide for assistance.
- How to select parking location having easy access and exit with MTCVs.
- The procedures for lane positioning, path selection and merging.
- How to minimize trailer drift and oscillatory sway while maintaining lane position or while merging.

SKILL OBJECTIVES

Driver must:

- Demonstrate coordination of speed and directional control to achieve the desired path while backing or parking.
- Demonstrate the ability to minimize trailer drift and oscillatory sway while maintaining lane position or while merging.
- Avoid cutting **across** lanes of travel to straighten out a curve.
- Coordinate steering input to prevent over or under steering.
- Adequately judge the path the trailers will take (off-tracking) as vehicle negotiates left or right curves and turns.

ATTITUDE OBJECTIVES

The driver must believe:

- That all backing is potentially dangerous, that the best way to avoid backing accidents is by avoiding the need to back.
- That all backing accidents can be avoided.
- That pull through parking spaces are the safest places to park MTCVs.
- Preplanning how you will exit is the first step to parking MTCVs.
- Proper lane positioning is absolutely essential to the safe operation of MTCVs.

Major supporting concepts

- Refer to instructional unit 2.4

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MATERIALS

Classroom instruction must be supported by printed or visual materials that describe common hazards encountered by MTCVs and the consequences of improper safety procedures.

On-range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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6.5 Turning, Steering and Tracking

Purpose

This unit provides a review of the principles dealing with turning situations, steering maneuvers and the tracking of MTCV trailers. This is to include instruction on trailer sway and off-tracking. Emphasis is placed on maintaining directional stability. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ Vehicle configuration considerations

- A. Towing unit.
- B. Coupling devices.
- C. Cargo carrying units.

➤ Vehicle handling characteristics

- A. Driver controls four to six components comprising two to three vehicles (tractor/truck - semi/full trailer(s)) each having separate steering characteristics.
- B. Tractor has oversteer tendencies.
- C. Truck & trailers may have over or understeer tendencies depending on weight and load placement.
- D. Specific vehicle considerations.

➤ Trailer fidelity (tracking)

- A. Causes of trailing infidelity:
 - 1. Fifth wheels.
 - a. Properly mounted.
 - b. Jaws properly adjusted.
 - c. Properly lubricated.
 - 2. Other vehicle components, i.e. tires, suspension, etc.
 - 3. Rough pavement.
 - 4. Load distribution & center of gravity.
 - 5. Driver inexperience.
 - 6. Pintle hook snubbers.
 - 7. Rapid steering movement (high speed).

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➤ Off-tracking

- A. Definition.
- B. Swept path.
- C. Low speed off-tracking.
 - 1. Trailer tracks to the inside.
 - 2. As speed increases off-tracking decreases to zero.
- D. High speed off-tracking.
 - 1. Trailer tracks to the outside.
 - 2. Tire slip angles.
- E. Rearward amplification.

➤ Summary of safety concerns

- A. Condition and type of coupling devices.
- B. Condition of shuck absorbers, springs, tires, tire pressure, etc.
- C. Braking in a curve.
- D. Pulling trailers versus having trailers push vehicle in a turn or curve.
- E. Examples of how directional instabilities can occur.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Position the vehicle for a turn and negotiate turns (left and right) of different degrees and ratios.
- 0 Assume a safe speed prior to entering a turn and completing the turn at neither an excessive nor insufficient speed.
- 0 Select and properly position in the turning lane offering the best mobility and least traffic interference, and complete the turn into the proper lane of travel.
- Negotiate turns without trailer tires crossing demarcation line, touching curb or running off pavement edge.
- 0 Minimize steering input in order to minimize trailer sway.
- 0 Judge sides, rear, and overhead clearances and path of travel of the trailers.
- 0 Observe the rear of the trailer, through the appropriate mirror, while turning.

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KNOWLEDGE OBJECTIVES

Driver must know:

- The proper position from which to begin a turn and how to “set up”, execute and recover from a turn.
- The steering characteristics of tractors and trailers and what the driver can do to control rearward amplification.
- The procedures for carrying out the performance objectives.
- How to control trailer drift and oscillatory sway while turning.
- The factors which determine the safe speed for a turn.
- The proper lane to proceed from and to end in when making turns (left and right) from single and multiple lane into single and multiple lanes.
- The basic principle of trailer tracking & off-tracking.
- The differences between low and high speed off-tracking.
- The basic causes of trailer off-tracking and the procedures for minimizing the effect of off-tracking.
- The relationship of wheel base length, articulation, and number of axles to path of a turn.

SKILL OBJECTIVES

Driver must:

- Adequately judge the path the trailers will take (off-tracking) as vehicle negotiates left or right curves and turns.
- Demonstrate coordination of speed and directional control to achieve the desired path of travel.
- Demonstrate the ability to control trailer drift and oscillatory sway while maintaining lane position while turning.
- Coordinate steering input to prevent over or understeering.

ATTITUDE OBJECTIVES

The driver must believe:

- That proper lane positioning is absolutely essential to safe MTCV operation.
- That smooth steering is critical to maximum trailer stability when maneuvering MTCV.
- That the best way to minimize the effect of evasive maneuvers (to vehicle stability) is to recognize the situation and begin evasive steering as soon as possible. Early recognition can reduce the severity of the maneuver.

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Major supporting concepts

- Refer to instructional unit 2.5

MATERIALS

Classroom instruction must be supported by printed or visual materials that describe common hazards encountered by MTCVs and the consequences of improper safety procedures.

On-range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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6.6 Proficiency Development: Vehicle Familiarization

Purpose

The purpose of this unit is to enable drivers (trainees) to gain the proficiency in basic operation needed to safely undertake on-street instruction in the Performance Practice section of the curriculum.

The activities of this unit consist of driving range (yard) exercises that provide practice for the development of basic control skills and mastery of basic maneuvers. Trainees practice skills and maneuvers learned in Units 6.3, 6.4, and 6.5. A series of basic exercises are practiced on the range until trainees develop sufficient proficiency to transition to on-street driving.

Only after the student's skills have been measured and found to be adequate will the student be allowed to transition to on street driving.

Nearly all activity in this unit will take place on the range or under low-density traffic conditions. There is a brief classroom session to familiarize trainees with the exercises they will perform on the range and how their performance will be rated.

Outline of Suggested Content

➤ **Introduction to proficiency development exercises (Classroom)**

- A. Description and purpose of range exercises.
- B. Procedures and practice routines.
- C. Standards for performance evaluation.
- D. Safety rules for range exercises.

➤ **Proficiency development: Basic control (range) Practice exercises.**

- 1. Coupling & Uncoupling
- 2. Turnabout.
- 3. Forward stop.
- 4. Forward serpentine.
- 5. Offset alley.
- 6. Tight circles -- left and right.

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➤ **Skill attainment evaluation.**

1. Performance testing for basic control skills.
2. Identification of remedial or additional practice needed to meet standards and/or unit objectives for each vehicle configuration.

➤ **Proficiency development: Basic maneuvers (pre-street)**

Practice exercises.

(range or low-density traffic conditions).

1. Starting, upshifting, downshifting and stopping.
2. Lane - keeping / straight.
3. Lane - keeping / curve.
4. Lane - keeping / turn.
5. Right turns
6. Left turns.
7. Curves.

➤ **Practice basic skills and maneuvers: On-street
(Routes with little to limited amount of traffic)**

A. Roadway exercises:

1. Starting, upshifting, downshifting and stopping.
2. Left and right turns.
3. Lane - keeping.
4. Lane changes.
5. Negotiating curves.
6. Situations:
 - a. Straight without significant curves.
 - b. Straight with significant curves.
 - c. Controlled and uncontrolled interchanges.
 - d. Freeway interchanges.
 - e. Hills and grades.

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➤ Skill attainment evaluation

- 0 Trainee performance is evaluated against a prescribed criteria, including these basic control factors:
 1. **Acceleration:** Smooth acceleration; no jerky, abrupt acceleration from a standing start and when increasing speed.
 2. **Braking:** Smooth, controlled stops, no rebound of front end or sound of exhausting air.
 3. **Stopping point:** Comes to a complete stop within 3 feet of stopping point or within sufficient distance from the vehicle ahead.
 4. **Upshifting:** Shifts through all gears without hesitation. Does not miss or skip a gear causing lurching / lugging (failure to shift soon enough). Shifts smoothly at proper RPM without jerking the vehicle. Double clutches all shifts with a minimum of grinding.
 5. **Downshifting:** The gear selected is suitable to the road speed of the vehicle driven. Shifts smoothly without hesitation and minimal grinding of the gears. Double clutches all shifts.
 6. **Uphill Operation:** The gear selected is suitable to the road speed and gradeability of the engine. Driver shifts smoothly without hesitation and minimal grinding. Double clutches all shifts.
 7. **Starting On An Incline:** Driver pulls away from the stop smoothly. Engine remains running. Vehicle does not roll back. Driver properly coordinates the parking brake, foot brake, and throttle resulting in the vehicle pulling away smoothly.
 8. **Downhill Operation:** Driver starts down the hill in the proper gear and uses the appropriate braking technique for the decline. Speed does not exceed the posted speed limit.
 9. **Speed Adjustment - Curves:** Driver adjust speed prior to entering curve and maintains appropriate speed throughout curve. Driver does not shift or brake in the curve.
 10. **Lane-Keeping - Straight:** Driver maintains lane position in path of travel without touching or crossing lane markings.
 11. **Lane-Keeping - Curve:** Driver maintains lane position in path of travel without wandering back and forth between lines or touching or crossing lane markings.
 12. **Lane-Keeping - Turn:** Driver operates vehicle within the designated lane without crossing lane demarcation lines or running off pavement edge, unless vehicle length and street width necessitates encroachment.

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- a. **Right Turn:** Driver negotiates right turn without trailer tires crossing lane demarcation line, touching curb or running off pavement edge, unless vehicle length and street width requires it.
- b. **Left Turn:** Driver negotiates left hand turn without cutting across the top of the turn (crossing the center line of the street he/she is entering), unless vehicle length and street width requires it.
13. **Curves:** Driver holds lane position without drifting or weaving. Trailer wheels are kept within lane markings and driver steers appropriately to the far left or right to compensate for the off-tracking of the trailers,
14. **Signaling:** Driver activates appropriate signal before performing maneuver, Driver cancels signal before upshifting or within 5 seconds of accomplishing maneuver.
15. **Mirror Checks:** Driver makes regular checks (approximately every ten seconds) of his / her mirrors to be aware of traffic and to check condition of vehicle.
16. **Mirror Checks - Turns:** Driver checks position of trailer with appropriate mirror or by looking over his / her shoulder when the rear of the trailer reaches the top of the turn.
17. **Mirror Checks - Lane Change:** Driver checks appropriate mirror before initiating lane change. Driver maintains lane position while checking appropriate mirror.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to **perform** the **following** to the level of proficiency required to permit safe **entry** into **on-street instruction**:

- Maneuvering through sharp turns (e.g., offset or alley).
- Maneuvering through a series of sharp turns (e.g., forward serpentine).
- Maneuvering into areas restricted to the rear, sides, and front.
- Judging the position of the right wheels,
- Judging clearances at the rear, front and sides.
- Maintaining proper vehicle and engine speed on upgrades and downgrades.

KNOWLEDGE OBJECTIVES

Driver must know:

- No new objectives.

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SKILL OBJECTIVES

Driver must:

- Coordinate acceleration and braking to maneuver the vehicle with a high level of proficiency.
- Coordinate clutch, throttle and gear shift to maintain engine at proper speed when shifting on upgrades and downgrades.

ATTITUDE OBJECTIVES

The driver must believe:

- No new objectives.

Major supporting concepts

- Refer to instructional unit 2.6

MATERIALS

Classroom instruction must be supported by dynamic visuals **or** sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by MTCV drivers. Also required are printed or visual materials that describe common hazards and the frequency with which they are encountered and materials that review commentary driving techniques.

On range and on street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and:

- Rules for range exercises
- Rules for on-street driving
- Range diagrams for exercises
- Driver performance scoring criteria checklist **or** scoring forms

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UNIT 6.6 DRIVER RULES FOR RANGE EXERCISES

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow **all** range exercise procedures exactly. If you do not understand an instruction or exercise, ask for help before proceeding.
- D. Only one vehicle may be operated within an exercise layout.
- E. In the case of any malfunction, emergency, or problem, stop and alert an instructor.
- F. Always check on all sides of the vehicle before moving.
- G. When you are observing other trainees' driving, stay well back from the moving vehicles. Do not stand close to a moving truck and never where the driver cannot see you.
- H. Maintain a safe distance between your vehicle and others.
- I. No trainee may drive after drinking any alcoholic beverage nor when taking drugs or other medication that may affect their ability to drive safely.

UNIT 6.6 DRIVER RULES FOR ON-STREET DRIVING

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow all instructions given by the driving instructor, If you do not understand an instruction, ask for clarification before proceeding.
- D. Alert the driving instructor to any malfunction or potential malfunctions indicated by gauges, warning lights, etc.
- E. Obey all traffic laws.
- F. Carry your drivers license or learners permit, medical certificate, and logbook at all times.
- G. No trainee may drive after drinking any alcoholic beverage or when he/she is taking prescribed drugs or other medication that may affect his / her ability to drive safely.
- H. Check your path carefully before moving.
- I. Trainees in the vehicle who are not driving, must be observing the driver and the road ahead. They may not carry on conversations that will distract the driver.

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SECTION 7 - Performance Practice

The units in this section provides the trainee drivers an opportunity to familiarize themselves with a different MTCV vehicle. In this section the driver will apply the basic competencies he/she acquired in Section 3 to a different MTCV.

The units in this section cover the interaction between MTCV drivers, the vehicle, and the traffic environment. They are intended to provide driver trainees an opportunity to apply their training, experience and basic operating skills (acquired in section 6) in a way that ensures their safety and that of other road users under various road, weather and traffic conditions.

Six units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
7.1	Interacting With Traffic	0.75			1.5	2.25
7.2	Speed & Space Management	0.5			2	2.5
7.3	Night Operations	0.5		1	2	3.5
7.4	Extreme Driving Conditions	0.5				0.5
7.5	Hazard Perception	0.5			1	1.5
7.6	Proficiency Development	0.25			4	4.25
TOTAL		3	0	1	10.5	14.5

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7.1 Interacting With Traffic

Purpose

This unit provides instruction on the principles of visual search, communication and sharing the road with other traffic. Emphasis is placed on visual search, mirror usage, signaling and/or positioning the vehicle to communicate and understanding the special situations encountered by MTCVs in various traffic situations. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ Introduction to sharing the road with other traffic.

- A. As others see MTCVs.
- B. MTCV trailers can be intimidating to other road users.
- C. Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- D. MTCVs in the traffic stream can influence others sharing the road.
- E. MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.

➤ Visual search techniques

- A. Looking ahead
 - 1. Importance of looking far enough ahead.
 - 2. How far and how often to look ahead.
 - 3. What to look for in traffic and road conditions,
- B. Mirror usage
 - 1. Importance of clean and properly adjusted mirrors.
 - 2. Incorporating mirror adjustment in vehicle inspection procedures.
 - 3. Know the characteristics of various mirrors used.
 - a. Fields of vision,
 - b. Location and extent of blind spots.
 - c. How to read speed and distance of overtaking vehicles.
 - d. How to account for distortion of convex mirrors.
 - e. Amount of distortion and overlap between plane or flat and convex mirrors when used in combination.

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4. What to look for in your mirrors.
 - a. Traffic on either side and in back of the vehicle.
 - b. Check your vehicle and the tracking of the trailers behind the tractor.
5. Incorporate mirrors in visual search techniques.
 - a. Check mirrors quickly and frequently, looking back and forth between the mirrors and the road ahead.
 - b. Increase mirror usage during maneuvers such as lane changes, turns, merges and heavy traffic.
 - c. Be aware of blind spots and use your mirrors to compensate. Other traffic has to move into a blind spot. Proper visual search will reduce the probability of someone entering your blind spots unnoticed.
6. Vision problem areas around vehicle.
 - a. Area in front of hood.
 - b. Passenger side of truck - forward of fuel tank.
 - c. Driver side of truck - rearward of fuel tank.
 - d. Rear of truck or back of trailers.
 - e. During 90 degree right turn **rearmost** trailer will be lost in the mirrors.
7. Vision problems due to environmental conditions.
 - a. Bright sunlight or glare.
 - b. Rain, sleet, snow or dust storm.
 - c. Fog, low clouds in mountains or smoke from any source.
 - d. Darkness, dawn or dusk.

➤ Communications

- A. Signal to communicate what you intend to do in turns, lane changes, slowing down and preparing to stop.
- B. Use of brake light to communicate presence or intentions.
- C. Use of four-way flashers to communicate presence or intentions.
- D. Use of headlights to communicate presence or intentions.
- E. Use of horn to communicate presence or intentions.
- F. The way the vehicle is positioned can assist in communicating your intentions **or** confuse other traffic.
- G. Certain situations such as hazards, severe road conditions, weather conditions (rain, sleet, snow, fog, dust storm, low clouds in the mountains) or whenever it is difficult to see (night, dawn, dusk, or smoke) requires special effort to communicate presence and intentions.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Adjust road speed and space around vehicle to accommodate other traffic.
- 0 Clean and properly adjust both flat and convex mirrors on the vehicle.
- 0 Change or adjust mirror settings for trailers of different widths.
- 0 Maintain a minimum 12 second visual search lead time.
- 0 Scan both sides of the road using quick glances and describe roadside and or adjacent vehicle activity.
- 0 Include appropriate instrument panel checks in the visual search pattern.
- 0 Adjust visual search pattern during maneuvers such as lane changes, turns and merges.
- 0 Measure speed and distance of overtaking vehicles.
- 0 Monitor traffic entering and exiting the vehicle's blind spots.
- 0 Monitor trailers and identify signs of vehicle problems.
- 0 Adjust speed and space around vehicle for vision impairment due to environmental conditions.

KNOWLEDGE OBJECTIVES

Driver must know:

- How to compensate for the lack of understanding of others with whom we share the road.
- That other motorists are used to seeing only one trailer and that this perception could cause a hazardous situation.
- That the presence of MTCVs in the traffic stream influences the operation of other vehicles.
- The effects of having additional points of articulation.
- How to control rear trailer sway or amplification.
- The proper adjustments of the various types of mirrors.
- The difference in images presented by flat and convex mirrors.
- Appropriate visual search techniques for various road, traffic and maneuvering conditions.
- The relationship between speed and sight distance.
- The location and extent of blind spots on his / her vehicle.
- That truck blind spots are a safety concern that can only be reduced through incorporating appropriate mirror usage into visual search techniques.

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- When to actuate turn signals to provide adequate warning without creating confusion.
- State traffic laws for turn signals.
- The importance of signaling for the prevention of accidents.
- That not giving appropriate signals could lead to an accident.
- The **conditions under** which other drivers may give false signals.
- The appropriate use of the horn is to give warning to others of your presence only when needed.

ATTITUDE OBJECTIVES

The driver must believe that:

- Obeying traffic laws is important and will reduce the risks of having an accident.
- Courtesy on the highway is important and is a good safety principle to follow.
- The perception of how others see professional drivers handling themselves and their vehicles is very important.
- A professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.
- Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- It is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- A professional driver is always in control of his / her vehicle and his / her emotions.
- Emotional instability can contribute to unsafe acts.
- MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.
- The ability to respond to changing road conditions requires proper visual search techniques.
- The first sign of trouble is often identified by the driver when checking his / her mirrors.
- Development of good visual search habits is essential to safe driving and will reduce driver fatigue.
- Signaling one's intentions is essential to avoiding accidents.
- Improper use of the horn, signals, and the cb is potentially dangerous and will tarnish the image of the professional driver.

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Major supporting concepts

- Refer to instructional unit 3.1

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on how professional drivers interact with other traffic.

On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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7.2 Speed and Space Management

Purpose

This unit provides instruction on the principles of speed and space management. Emphasis is placed on maintaining safe vehicular speed and appropriate space surrounding the vehicle under various traffic and road conditions. Special attention is placed on understanding the special situations encountered by **MTCVs** in various traffic situations. Most of the instruction is to take place in the vehicle.

Outline of Suageded Content

➤ Speed management

- A. The importance of Speed management.
- B. Speed and stopping distance.
 - 1. Perception distance.
 - 2. Reaction distance.
 - 3. Braking distance.
- C. Vehicle weight and stopping distance.
 - 1. Total vehicle weight and traction.
 - 2. Weight distribution in each trailer.
 - 3. One or more empty trailers.
- D. Vehicle configuration, speed and shape of the road.
 - 1. Wind resistance and cross winds.
 - 2. Effect of gap between trailers and wind resistance.
 - 3. Road curves, grades, crowns.
 - 4. Lane widths, narrow bridges, and soft shoulders.
- E. Matching speed to road surface conditions.
 - 1. Traction and road surface friction.
 - 2. Slippery and icy road conditions.
 - 3. Hydroplaning, black ice.
 - 4. Shaded areas and bridge freeze first.

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- F. Speed and sight distance.
 - 1. Sight distance and 12 to 15 second rule.
 - 2. Effect of speed on field of vision.
- G. MTCVs in the traffic flow.
 - 1. How MTCVs influence the traffic flow.
 - 2. Speed Management in traffic.
 - 3. Speed Management in merging situations.
- H. Speed limits and speed management.
 - 1. Speed limit may be too fast.
 - 2. Problems encountered when safe is slower than the speed limit.
- I. Effect of speeding on equipment and driver.
 - 1. Accelerated deterioration of equipment.
 - 2. Increased breakdowns.
 - 3. Increased cost of operation per mile.
 - 4. Driver fatigue and decreased response to road, hazards and environment.

➤ **Space management**

- A. The importance of Space management
- B. Space cushion around vehicle.
- C. Space to the sides.
 - 1. Positioning vehicle properly on road surface.
 - 2. Adjusting within lane for various road conditions.
 - 3. Positioning vehicle properly for various maneuvers.
 - a. Curves.
 - b. Exit & entrance ramps.
 - c. Lane changes.
 - d. Turns.
- D. Space ahead of vehicle.
 - 1. Following distance rule.
 - 2. Affect on space behind vs. ahead.
 - 3. Legal requirements for following distance.

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E. Space behind vehicle.

1. Adjust fur blind spot.
2. How to deal with tailgaters safely.

F. Space above and below the vehicle.

1. Overhead abutments, bridges, wires. etc.
2. Road hazards and debris.
3. Elevated railroad crossings and driveways.

G. Traffic gaps and merging situations.

1. Definition of gap in traffic.
2. Space and speed requirements when:
 - a. Crossing and entering traffic.
 - b. Passing.
 - c. Merging.
 - d. Railroad crossings.
3. Alignment with traffic when merging.
4. **Six** point procedure fur merging into gaps.
 - a. Look fur gap.
 - b. Signal fur gap.
 - c. Aligning.
 - d. Find, locate or select gap.
 - e. Adjust speed.
 - f. Enter gap.

H. Giving space to others.

1. Principles of right of way.
2. Avoid hindering traffic.
3. Adjust following distance to **produce** gap fur others.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Judge the maximum safe speed at which a curve can be entered.
- Judge the maximum safe speed that traction will permit.
- Judge the maximum safe speed at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- Adjust road speed of MTCVs to the configuration and condition of the roadway.
- Adjust road speed of MTCVs to weather and visibility conditions.
- Adjust road speed of MTCVs to vehicle, cargo and driver conditions.
- Adjust road speed and space around vehicle to accommodate other traffic.
- Obey the legal speed limit.
- Select the lane of travel which offers best mobility and least traffic interruption, in accordance with the law.
- Establish a safe gap before changing lanes, passing other vehicles, and Crossing or entering traffic.
- Position the vehicle correctly in the lane of travel thereby minimizing hazards to other road users.
- Position the tractor and trailers appropriately while initiating and completing various maneuvers such as curves, exit and entrance ramps, lane changes, and turns.
- Maintain a following distance appropriate to traffic flow, road surface, weather, visibility and vehicle weight configuration.
- Must be able to avoid road hazards, debris and overhead structures with inadequate clearance.

KNOWLEDGE OBJECTIVES

Driver must know:

- The relationship of speed to stopping distance, hydroplaning, fuel economy and crash severity.
- What effects the points of articulation will have on speed management.
- What effects the points of articulation will have on the ability to maneuver.
- How to minimize rear trailer sway or amplification, sometimes referred to as crack-the-whip effect.

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- 0 The effect of vehicle weight distribution, center of gravity, vehicular stability, and road surface conditions on the maximum safe speed a set of MTCVs can travel.
- The relationship between speed and sight distance.
- 0 The minimum safe following distance under various road, weather and traffic conditions.
- 0 That moving MTCVs encounter more air resistance than singles, especially with crosswinds. This is attributable to both the gaps between the trailers and to the increased overall length.
- 0 As **vehicle** speed increases, the angle decreases at which directional or lane changes can be made safely.
- 0 That speed adjustment is particularly critical on older roads built for smaller, slower **vehicles**.
- 0 State regulations concerning following distances, lane use, changing lanes, and passing other vehicles with MTCVs.
- 0 The appropriate following distance for various load configurations and road, weather and traffic conditions.
- 0 The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards.
- 0 The importance of proper positioning of the vehicle in its path of travel in response to road, weather and traffic conditions.
- 0 The importance of timing, acceleration and traffic gaps in order to manage space in traffic.
- 0 The dangers created by overhead obstructions.

SKILL OBJECTIVES

The driver must judge:

- The maximum safe speed at which a curve can be entered; that traction will permit; and, at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes.
- The minimum safe following distance under various road, weather and traffic conditions, using the following basic rule: Allow one **second** of space for each 10 feet of vehicle length at speed below 40 mph. At speed above 40 mph add one **second** for safety.

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ATTITUDE OBJECTIVES

The driver must believe:

- That driving skill and experience (proficiency) cannot compensate for speed that is excessive for prevailing conditions.
- There are situations where the speed limit may be too fast for road, weather and or traffic conditions.
- That obeying the speed limit is beneficial to the driver, his / her employer and will reduce the risks of having an accident.
- That courtesy on the highway is a good safety principle to follow.
- That the ability to respond to changing road conditions requires proper speed and space Management techniques.
- That maintaining maximum separation from other vehicles increases sight distance and the opportunity to maneuver in response to hazards.
- That maintaining a minimum safe following distance under various road, weather and traffic conditions is important.
- That proper positioning of MTCVs is important to accident prevention,
- That it is the driver's responsibility to position the vehicle in such a way as not to impede other road users.
- That intimidating other road users by not maintaining minimum safe following distance under prevailing road, weather and traffic conditions is illegal, unsafe, and detrimental to public relations.
- When bobtailing, pulling an empty trailer(s) or pulling unstable or unevenly balanced loads, the basic formula for safe following distance needs to be increased.

Major supporting concepts

- Refer to instructional unit 3.2

MATERIALS

Classroom instruction must be supported by materials presenting information on speed and accidents, including visuals that illustrate the effects of various factors on speed and space management.

On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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7.3 Night Operations

Purpose

This unit provides instruction on the principles of Night Operations. Emphasis is placed on the factors affecting operation of **MTCVs** at night. Night driving presents specific factors that require special attention on the part of the driver. Changes in vehicle safety inspection, vision, communications, speed management and space management are needed to deal with the specific problems night driving presents. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ Night driving factors

A. Driver factors.

1. Vision.
2. Glare.
3. Fatigue.
4. Driver experience.

B. Roadway factors.

1. Level of illumination.
2. Variations in level of illumination.
3. Familiarity with roads.
4. Other road users.
5. Alcohol and drugs on the road.

C. Vehicle factors

1. Headlights.
2. Marker lights.
3. Auxiliary lights.
4. Turn signals.
5. Windshields.
6. Mirrors.
7. Length of vehicle.

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D. Conspicuity

1. Principle of conspicuity.
2. Levels of illumination & reflective markings.
3. Positioning of vehicle and visibility.
4. Turning maneuvers and visibility of vehicle.
5. Rear and side underride potential.

➤ Night driving procedures

A. Preparation to drive at night.

1. Getting yourself ready.
2. Plan your route.
3. Getting your vehicle ready.
4. Vehicle Safety Inspection at night.

B. Driving at Night

1. Avoid blinding others.
2. Avoiding glare.
3. Maximizing visibility.
4. Adjusting basic driving techniques.

C. Speed and sight distance at night.

1. Sight distance and 12 to 15 second rule.
2. Effect of sight distance on perception and total stopping distance.
3. Effect of illumination on field of vision.
4. Speed limit may be too fast.
5. Problems encountered when a safe speed is slower than the speed limit.

D. Space cushion around vehicle at night.

1. Space to the sides.
2. Space ahead of vehicle.
3. Affect on space behind vs. ahead.
4. Legal requirements for following distance.
5. Traffic gaps and merging situations.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Judge the maximum safe speed at which vehicle control can be maintained under various levels of illumination.
- 0 Adjust speed, following distance, and gap selection to nighttime conditions.
- 0 Judge when to use high beams on headlights when legally permitted.
- Dim headlights, in accordance with state laws, to minimize interference with visibility of other drivers.
- Respond safely to the glare of other vehicles by averting eyes and not retaliating.

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 The effect of the level of illumination on ability to see (sight distance).
- The relationship between speed, illumination and sight distance.
- 0 The appropriate following distance for various load configurations, road, weather and traffic conditions at night.
- The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards at night.
- The value of high beams to nighttime visibility.
- State laws governing use of headlights, high beams and auxiliary lights.
- The symptoms and dangers of fatigue.
- The effect of headlight glare on visibility of others and its implication for the safety of both road users.
- The general factors affecting night vision including interior illumination, ambient light and use of sunglasses during daytime.

SKILL OBJECTIVES

The driver must judge:

- Speed, distance, and separation between traffic under nighttime conditions.
- The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes at night.

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ATTITUDE OBJECTIVES

The driver must believe:

- The ability to see clearly diminishes at night.
- Driving skill and experience (proficiency) cannot compensate for speed that is excessive for levels of illumination and sight distance,
- There are situations where the speed limit may be too fast for levels of illuminations or sight distance.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards at night.
- That maintaining a minimum safe following distance under various levels of illumination is important.
- No one is immune to the effects of fatigue.
- That retaliating to other road users by using high beams is illegal, unsafe, and detrimental to public relations.

Major supporting concepts

- Refer to instructional unit 3.3

MATERIALS

Classroom instruction must be supported by materials presenting information on night driving procedures and the effects of various factors on sight distance and conspicuity. Include visuals demonstrating the effects of darkness and the consequences of improper night driving procedures.

On-range and on-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

Trainees must be provided the opportunity to pre-trip, build, stage, or assemble units at night as part of the night operations curriculum.

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7.4 Extreme Driving Conditions

Purpose

This unit provides instruction on driving a particular MTCVs under Extreme Driving Conditions. Emphasis is placed on the factors affecting the operation of MTCVs in cold, hot and stormy weather and in the mountains and the desert. Changes in basic driving habits are needed to deal with the specific problems presented by these Extreme Driving Conditions.

Outline of Suggested Content

➤ Cold weather operation

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, fuel mixture, heater, defroster, windshield wipers, washer fluid, brakes, fifth wheel, etc.
2. Tires, mud flaps and tire chains, condition, types, installation etc.
3. Cold weather starting procedures.
4. Road and weather condition hazards while doing VSI.
5. Freeing a stuck vehicle or frozen brakes.

B. Driving in cold weather.

1. Vehicle speed, weight and stopping distance under various road conditions.
2. Total vehicle weight and traction under various road conditions.
3. Weight distribution in each trailer.
4. One or more empty trailers.
5. Wind resistance and crosswinds under various road conditions.
6. Effect of gap between trailers under various road conditions.
7. Road curves grades and crowns under various road conditions.
8. Shaded areas and bridges freeze first.

➤ Hot weather, desert conditions.

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner defroster, windshield wipers, windshield washer fluid, brakes, fifth wheel, etc.
2. Tires and brakes, condition, types, pressure etc.

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B. Driving in desert conditions.

1. Procedures and hazards.
2. Effects upon vehicle operation.
3. Effects upon driver alertness.
4. Breakdown procedures.

➤ Mountain driving.

A. Gravity.

1. Total vehicle weight and speed control.
2. Weight distribution in each trailer.
3. One or more empty trailers.

B. Mountain pre-inspection.

C. Operating on upgrades.

D. Operating on downgrades.

E. Auxiliary braking devices (engine retarders).

F. Truck escape ramps.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES: Adverse Weather

Driver must be able to:

- Prepare for operation in cold weather including use and installation of tire chains when necessary.
- Inspect vehicle and prepare for cold weather operation by paying special attention to coolant level and mixture of anti-freeze, fuel mixture, moisture in air tanks, heater, defroster, windshield wipers, washer fluid, brakes fifth wheel, etc.
- Check for ice accumulation on brakes, slack adjusters, air hoses, electrical wiring, etc.
- Judge the maximum safe speed at which vehicle control can be maintained under various weather and road conditions.
- Adjust speed, following distance, and gap selection to weather and road conditions.

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KNOWLEDGE OBJECTIVES: Adverse Weather

Driver must know:

- The conditions that produce low traction and the effects of rain snow and ice on the ability to maneuver and/or stop MTCVs.
- The relationship between vehicle speed, weight and stopping distance under adverse weather conditions.
- The causes and procedures for avoiding skidding, hydroplaning and jackknifing MTCVs.
- The appropriate following distance for various MTCV load configurations, road, weather and traffic conditions under adverse weather conditions.
- The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards encountered under adverse weather conditions.
- How and where to mount and dismount tire chains on MTCVs.

SKILL OBJECTIVES: Adverse Weather

The driver must:

- Adjust rate of change in speed (acceleration and deceleration) and direction of travel to road and weather conditions to maintain control of vehicle.
- Judge appropriate speed, distance, and separation between traffic under adverse weather conditions.

ATTITUDE OBJECTIVES: Adverse Weather

The driver must believe:

- That adverse weather conditions require special driving techniques and increased vigilance on the part of MTCVs drivers.
- Driving skill and experience (proficiency) cannot compensate for speed and directional changes that are excessive for weather and road conditions.
- There are situations where the speed limit may be too fast for road, weather and traffic conditions.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards .
- That it is especially important for drivers of MTCVs to keep themselves informed of latest weather and road conditions.

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PERFORMANCE OBJECTIVES: Hot Weather, Desert Conditions

Driver must be able to:

- Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner, defroster, windshield wipers, windshield washer fluid, tires, brakes, fifth wheel, etc.
- Adjust driving habits to accommodate effects of desert heat.

KNOWLEDGE OBJECTIVES: Hot Weather, Desert Conditions

Driver must know:

- Procedures and hazards for hot weather, desert driving.
- The effects of hot weather driving on engine operating range, cooling system, fuel system, tires / tire pressure and the driver himself/herself.

SKILL OBJECTIVES: Hot Weather, Desert Conditions

The driver must:

- Judge road direction and distance in the desert.

ATTITUDE OBJECTIVES: Hot Weather, Desert Conditions

The driver must believe:

- That hot weather can affect vehicle operation.
- That special precautions are required in inspecting MTCVs and preparing for hot weather / desert operation.
- That it is dangerous to leave a vehicle when it is disabled in the desert

PERFORMANCE OBJECTIVES: Mountain Driving

Driver must be able to:

- Do a mountain pre-inspection and adjust brakes if necessary.
- Place transmission in appropriate gear while ascending and prior to descending grade.
- Use proper braking techniques while descending grade.

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KNOWLEDGE OBJECTIVES: Mountain Driving

Driver must know:

- The effect of vehicle weight distribution and speed on downhill braking techniques.
- The function and value of escape ramps.

SKILL OBJECTIVES: Mountain Driving

The driver must:

- Utilize appropriate gear for descending grade:
- Operate braking system for maximum efficiency and safety.

ATTITUDE OBJECTIVES: Mountain Driving

The driver must believe:

- The proper gear and appropriate downhill braking technique is important to safely descend a mountain.
- That use of a truck escape ramp is safer than attempting to negotiate a downgrade when the vehicle is out of control.

Major supporting concepts

- Refer to instructional unit 3.4

MATERIALS

Classroom instruction must be supported by materials presenting information on extreme driving conditions and procedures for operating in extreme conditions.

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7.5 Hazard Perception

Purpose

This unit provides instruction on the principles of recognizing hazards in sufficient time to reduce the severity of the hazard and neutralize a possible emergency situation. While hazards are present in all motor vehicle traffic operations, some are peculiar to MTCV combinations. Emphasis is placed on hazard recognition, visual search, and response to possible emergency producing situations encountered by MTCVs in various traffic situations. Most of the instruction is to take place in the vehicle using commentary driving techniques.

Outline of Suggested Content

➤ Importance of hazard recognition

- A. Definition of a hazard.
- B. Role of visual search in hazard perception.
- C. Methods used in hazard perception.
- D. Sources of clues / where to look.

➤ Road characteristics

- A. Nature of problems encountered.
- B. Surface conditions due to weather, debris or construction.
- C. Shape and contour of the road.
 - 1. Tight curves with insufficient superelevation.
 - 2. Hazardous sequence of curves.
 - 3. Short deceleration lanes.
 - 4. Curb placement on curves.
 - 5. Ramp downgrades leading to tight curves.
 - 6. Off-tracking of MTCVs.
 - 7. Speed advisory signs for curves / ramps appropriate for cars not trucks.
- D. Visibility restrictions,
 - 1. Rain, sleet, snow, low clouds in mountains, fog and smoke.
 - 2. Dawn, dusk and night.
 - 3. Objects in line of sight.

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E. Crosswinds.

1. Signage.
2. Identification of probable locations.
3. Change in direction of travel.

➤ **Road user characteristics**

- A. Drivers with obstructed vision .
- B. Distracted or confused drivers.
- C. Slow moving vehicles.
- D. Impatient or impaired drivers.

➤ **Road user activities**

- A. Driver or vehicle movement.
- B. Emergency areas and pedestrians/cyclists.
- C. Conflicts.

➤ **Characteristics of MTCVs.**

- A. Definition of sensory feedback.
- B. MTCVs have additional points of articulation and therefore require additional vigilance and skills.
- C. Effect of additional coupling points on sensory feedback.
- D. Effect of gap between trailers under various road and traffic conditions.
- E. Effect of weight distribution in each trailer.
- F. Effect of isolation from trailing units with single pintle hook couplings.
- G. Reduced ability to sense impending trailer instability i.e. sliding, rollover, or bounce.
- H. Wind resistance and crosswinds under various road configurations.
- I. Development of special kinesthetic, body “feel” or sense for the trailing unit and the dynamic forces acting on it.
- J. Role mirrors play in identifying hazardous situations.

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➤ Commentary driving techniques

- A. Definition and role in safety education.
- B. Hazard identification.
- C. Hazard description.
- D. Search, Identify, Predict, Decide, Execute (SIPDE) concepts.
- E. Examples of commentary driving techniques.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Identify (using Commentary Driving techniques) road conditions and road users that pose a potential threat to the safety of the MTCV driver.
- Adjust road speed and space around vehicle to reduce the potential threat posed by either road conditions or other road users.
- Adjust visual search pattern to compensate for the potential threat posed by either road conditions or other road users.
- Monitor trailers and identify signs of impending hazardous situations.
- Develop a special kinesthetic sense or body "feel" for the trailing unit, through experience, vigilance and appropriate mirror usage.

KNOWLEDGE OBJECTIVES

Driver must know:

- The visible characteristics of road conditions that present a hazard to safe operation. This is to include slippery, soft, sloping, or uneven surfaces, debris, dangerous curves, obstruction to visibility, and locations where there are likely to be strong crosswinds, low clouds and fog.
- The characteristics of other road users (drivers or pedestrians) that make them potentially dangerous. This is to include obstructed vision, distraction, confusion, impatience, impairment, and low speeds.
- What activities of other road users are capable of providing clues to potential danger. This is to include head and body movement, vehicle movement, and emergency or conflicting situations.
- How to compensate for the lack of understanding of others with whom we share the road.
- That the presence of MTCV trailers in the traffic stream influences the operation of other vehicles.

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- How to develop a sense for the changing dynamic forces acting on the trailers.
- The effect of delayed trailer response to driver steering.
- How to compensate for the increased number of coupling points and resulting impaired sensory feedback when driving MTCV trailers.

SKILL OBJECTIVES

The driver must:

- Perceive immediately a potential threat by the visible characteristics and actions of other road users and initiate prompt defensive or evasive action.
- Perceive immediately a potential threat by the visible characteristics of road conditions and initiate prompt defensive or evasive action.
- Focus on developing a special kinesthetic or body “feel” or sense for the MTCVs trailing unit.

ATTITUDE OBJECTIVES

The driver must believe:

- That MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.
- That the ability to respond to changing road conditions requires constant vigilance and attention.
- That most hazards can be detected in time to avoid a collision.
- That serious hazards are encountered frequently enough to require constant attention to changes in the environment.
- That any delay in responding to a perceived hazard can result in an accident.
- That a professional driver has a moral obligation to himself/herself and the motoring public to do the best he/she can do.
- Professional drivers must compensate for the lack of understanding of others with whom we share the road.

Major supporting concepts

- Refer to instructional unit 4.1

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by MTCV drivers and materials that review commentary driving techniques. On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist.

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7.6 Proficiency Development: Performance Practice

Purpose

This unit provides drivers (trainees) an opportunity to refine, within the on-street traffic environment, their vehicle handling skills learned in this section. Driver performance will be closely monitored on progress towards the level of proficiency required for carrying out the basic traffic maneuvers of stopping, turning, merging, straight driving, curves, lane changing, passing, driving on hills, through traffic restrictions and parking. The driver will also be assessed for regulatory compliance with all traffic laws.

Nearly all activity in this unit will take place on the public roadway in a full range of traffic environments applicable to this vehicle configuration. This is to include urban and rural uncontrolled roadways, expressways or freeways, under light, moderate and heavy traffic conditions. There is a brief classroom session to familiarize drivers with the type of on-street maneuvers they will perform and how their performance will be rated.

The instructor will assess level of skill development of the trainee and increase in difficulty the types of maneuvers, roadways and traffic conditions the driver trainee is exposed to based upon his / her level of skill attainment.

Outline of Suggested Content

➤ Introduction to on-street proficiency development (Classroom)

- A. Description and purpose of on-street instruction.
 - 1. Safe operating procedures.
 - 2. Types of maneuvers on-street driving.
 - 3. Route planning.
- B. Procedures and practices,
 - 1. Safe operating procedures.
 - 2. Performance groups for on-street driving.
 - 3. Commentary driving techniques.
- C. Standards for performance evaluation.
 - 1. Vehicle control skills,
 - 2. Performance checks (criteria) for on-street driving.
- D. Safety rules for on-street driving.

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➤ Proficiency development on-street

- A. On-street driving preparation.
 - 1. Vehicle safety inspection.
 - 2. Build (couple) MTCV.
- B. Vehicle familiarization (low-density traffic conditions).
 - 1. Starting, upshifting, downshifting and stopping.
 - 2. Lane - keeping / straight.
 - 3. Lane - keeping / curve.
 - 4. Lane - keeping / turn.
 - 5. Right turns.
 - 6. Left turns.
 - 7. Driver trainee evaluation and feedback.
- C. Practice in safe operating practices: On-street
(Instructor discretion as to route and amount of traffic)
 - 1. Visual search techniques.
 - 2. Communications techniques.
 - 3. Speed management.
 - 4. Space management.
 - 5. Hazard perception and commentary driving.
 - 6. Night driving.
 - 7. Situations:
 - a. Various roadways based on skill attainment.
 - b. Controlled and uncontrolled interchanges.
 - c. Freeway interchanges.
 - d. Hills and grades.
 - e. Vehicle merges.
 - f. Traffic restriction areas.
 - g. Traffic control areas (stop sign or light controlled intersections).
 - h. Blind intersection.
 - i. Parking.

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➤ Skill attainment evaluation

- Trainee performance is evaluated against a prescribed criteria, including these basic control factors:
 1. **Acceleration:** Smooth acceleration; no jerky, abrupt acceleration from a standing start and when increasing speed.
 2. **Braking:** Smooth, controlled stops, no rebound of front end or sound of exhausting air.
 3. **Stopping point:** Comes to a complete stop within 3 feet of stopping point or within sufficient distance from the vehicle ahead.
 4. **Upshifting:** Shifts through all gears without hesitation. Does not miss or skip a gear causing lurching / lugging (failure to shift soon enough). Shifts smoothly at proper RPM without jerking the vehicle. Double clutches all shifts with a minimum of grinding.
 5. **Downshifting:** The gear selected is suitable to the road speed of the vehicle driven. Shifts smoothly without hesitation and minimal grinding of the gears. Double clutches all shifts
 6. **Uphill Operation:** The gear selected is suitable to the road speed and gradeability of the engine. Driver shifts smoothly without hesitation and minimal grinding. Double clutches all shifts.
 7. **Starting On An Incline:** Driver pulls away from the stop smoothly. Engine remains running. Vehicle does not roll back, Driver properly coordinates the parking brake, foot brake, and throttle resulting in the vehicle pulling away smoothly.
 8. **Downhill Operation:** Driver starts down the hill in the proper gear and uses the appropriate braking technique for the decline, Speed does not exceed the posted speed limit.
 9. **Speed Adjustment - Curves:** Driver adjust speed prior to entering curve and maintains appropriate speed throughout curve, Driver does not shift or brake in the curve.
 10. **Lane-Keeping - Straight:** Driver maintains lane position in path of travel without touching or crossing lane markings.
 11. **Lane-Keeping - Curve:** Driver maintains lane position in path of travel without wandering back and forth between lines or touching or crossing lane markings.
 12. **Lane-Keeping - Turn:** Driver operates vehicle within the designated lane without crossing lane demarcation lines or running off pavement edge, unless vehicle length and street width necessitates encroachment.

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- a. **Right Turn:** Driver negotiates right turn without trailer tires crossing lane demarcation line, touching curb or running off pavement edge, unless vehicle length and street width requires it.
- b. **Left Turn:** Driver negotiates left hand turn without cutting **across** the top of the turn (crossing the center line of the street he/she is entering), unless vehicle length and street width requires it.
- 13. **Curves:** Driver holds lane position without drifting or weaving. Trailer wheels are kept within lane markings and driver steers appropriately to the far left or right to compensate for the off-tracking of the trailers.
- 14. **Signaling:** Driver activates appropriate signal before performing maneuver. Driver cancels signal before upshifting or within 5 seconds of accomplishing maneuver.
- 15. **Mirror Checks:** Driver makes regular checks (approximately every ten seconds) of his / her mirrors to be aware of traffic and to check condition of vehicle.
- 16. **Mirror Checks - Turns:** Driver checks position of trailer with appropriate mirror or by looking over his / her shoulder when the rear of the trailer reaches the top of the turn.
- 17. **Mirror Checks - Lane Change:** Driver checks appropriate mirror before initiating lane change. Driver maintains lane position while checking appropriate mirror.
- 18. **Mirror Checks - merge:** Driver checks appropriate mirror before initiating lane change.
- 19. **Lane changing:** Driver pauses briefly (subsequent to signaling and checking mirror) before crossing lane delineator. Lane change is gradual and not abrupt. Driver maintains control of the vehicle and does not allow vehicle to wander.
- 20. **Merging:** Driver activates the turn signal in the direction of the intended merge before initiating merge; the vehicle is properly aligned to the roadway before a mirror check is made; driver makes a mirror check before initiating the merge.
- 21. **Traffic restrictions:** Driver obeys all traffic restrictions. i.e. using correct lane, obeys traffic control devices, maintains a safe speed below the posted speed limit, yields the right of way, drives within solid delineator or zebra stripe, etc.
- 22. **Uncontrolled intersection:** Driver looks both ways prior to entering the intersection; chooses appropriate rate of speed / gear for conditions.
- 23. **Railroad crossing:** Driver looks both ways prior to traveling over a railroad crossing; chooses an appropriate rate of speed / gear for conditions and doesn't shift gears while traveling through the railroad crossing.

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- 24. **Blind intersection:** Driver reduces speed and looks towards the blind intersection prior to entering it.
- 25. **Parking:** Driver considers or plans for the vehicle's exit prior to positioning the vehicle. Driver is legally and appropriately parked while not blocking other traffic. Driver sets the parking brake and puts the vehicle in the proper gear and or blocks the wheels.
- 26. **Right of way:** Driver proceeds on a technical right of way only when safe and appropriate. When appropriate driver yields the right of way. Driver exercises due caution for other vehicles and for pedestrians regardless of who has right of way.
- 27. **Following distance:** Driver constantly maintains adequate following distance, never crowding other vehicles.
- 28. **Vision management:** Driver scans for hazards as evidenced by eye and or head movement. Driver exhibits good vision management by identifying what he/she sees through the use of commentary driving techniques,

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- No new objectives.

KNOWLEDGE OBJECTIVES

Driver must know:

- No new objectives.

SKILL OBJECTIVES

Driver must:

- No new objectives.

ATTITUDE OBJECTIVES

The driver must believe:

- No new objectives.

This unit introduces no new instructional objectives. The in vehicle instruction provided for in this unit is intended to allow the driver trainee the opportunity to develop proficiencies, relative to all prior instructional objectives, to a level needed to pass the proficiency exam.

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RECERTIFICATION

SECTION 8 - Recertification

The units in this section provides drivers an opportunity to refresh, update and build upon their training and experience. In this section the drivers will apply the basic competencies he/she's acquired in various MTCV configurations and review how the interactions between themselves, the vehicle, and the traffic environment can ensure their safety and that of other road users under various road, weather and traffic conditions.

Emphasis is placed on the importance of safe operating practices, hazard identifications, driver professionalism, maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

Ten units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
8.1	Introduction / Inspection	1	0.75			1.75
8.2	Basic Off Street Maneuvers	0.5		1		1.5
8.3	Interacting With Traffic	0.75			1	1.75
8.4	Speed & Space Management	1			1	2
8.5	Night Operations	0.5		1	1	2.5
8.6	Extreme Driving Conditions	0.5				0.5
8.7	Hazard Perception	0.75			1	1.75
8.8	Hazardous Situations	1				1
8.9	Public Relations And Safety	1				1
8.10	Proficiency Evaluation	0.25		1	1	2.25
TOTAL		7.25	0.75	3	5	16

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8.1 Introduction / Inspection

Purpose

This unit serves as an orientation to the course and provides instruction on the systematic *vehicle* inspection of MTCV tractor trailers. This is to include pre-trip, enroute, and post-trip inspection procedures. While vehicle inspections are common in all commercial motor vehicle operations, some factors are peculiar to MTCVs. Emphasis is placed on component failure recognition.

Outline of Suggested Content

➤ Introduction

- A. Rules of conduct and safety.
- B. Course schedule and instructional unit outline.
- C. Course objectives and methods of evaluation.
- D. Requirements for completion of course.

➤ Professional driver

- A. Follow the law.
- B. Maintain a professional appearance.
- C. Maintaining a positive attitude.
- D. Conduct on and off duty.
- E. Following company rules and regulations.
- F. Federal Motor Carrier Safety Requirements.
- G. Basic job requirements,

➤ Review of vehicle pre-trip, enroute and post-trip inspection procedures

- A. Details of a good inspection,
- B. Federal requirements.
- C. Inspection procedures.

➤ Additional procedures for reporting

- A. Equipment lost, stolen, defective.
- B. Malfunctions or physical damage to tractor, trailers or dollies.
- C. Additional Company rules, policies, procedures~

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- **What to check out when inspecting tractor, trailers and converter dollies**
 - A. Review CHECKLIST: VEHICLE SAFETY INSPECTION
- **Vehicle walk around sequence**
 - A. Introduction.
 - B. Methodology.
 - C. Steps to follow.
- **Summary of safety concerns**
 - A. Proper procedures reduce the likelihood of accidents occurring.
 - B. The handling and stability characteristics most related to safety that are influenced by truck weight, size, and articulation are:
 1. Off-tracking.
 2. Response to rapid steering.
 3. Sensory feedback.
 4. Braking.
 5. Oscillatory sway.
 6. Rollover in steady turns.
 7. Yaw stability in steady turns.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Inspect and determine the condition of critical combination vehicle components, including instruments and controls; engine and drive train; chassis and suspension; steering system; air brake system; converter dollies; coupling systems; emergency equipment; and cargo securement devices.
- Perform pre-trip inspections on MTCVs in a regular, systematic sequence that is accurate uniform and time efficient.
- Perform enroute inspections by monitoring instruments and checking mirrors for signs of trouble; making periodic roadside inspections of critical components; and meeting enroute requirements for transporting hazardous materials.
 - While listening and feeling for indications of malfunctions is a normal part of performing enroute inspections, the driver of MTCVs must be cautious

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- to the fact sensory feedback is more seriously impaired when driving MTCVs than for tractor semitrailers.
- Perform post-trip inspection by making accurate notes of actual and suspected component abnormalities or malfunctions.

KNOWLEDGE OBJECTIVES

Driver must know:

- Course objectives and expectations.
- Rules of conduct and safety while in training.
- Methods of evaluating performance and standards to be met.
- Minimum requirements for completion of course.
- Company rules and regulations.
- Basic job and FMCSR requirements.
- The impact the driver has on the image of his / her company and the industry.
- Procedures for pre-trip, enroute, and post-trip vehicle inspection procedures.
- A systematic process to assure a rapid and complete inspection.
- The effect of undiscovered malfunctions upon safety, effectiveness, and economy.
- The importance of correcting malfunctions quickly before they pose a hazard to the driver or other road users.
- Federal, state, and other regulations governing vehicle inspections, including special regulations for hazardous materials cargo.

ATTITUDE OBJECTIVES

The driver must believe:

- That obeying traffic laws will not only reduce the risks of having an accident but will enhance the image of the professional driver.
- That company rules and government regulations are important and should be followed.
- That it is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- That a professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.
- It is the driver's obligation to insure that the vehicle is in safe operating condition before taking it out on the road and to cease operating it if an unsafe condition is discovered.

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- The consequence of breakdowns and accidents justify the time spent on the vehicle inspections.

Major supporting concepts

- Refer to instructional unit 2.1

MATERIALS

Classroom instruction must be supported by visual aids that demonstrate characteristics of vehicle malfunctions, their appearance, detection, and the adverse consequences of not identifying a vehicle malfunction. Also required are printed or visual materials that describe common malfunctions and the frequency with which they are encountered.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or vehicle safety inspection criteria work sheet.

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CHECKLIST: VEHICLE SAFETY INSPECTION

A. EXTERIOR LIGHTS

1. Demonstrates high and low beam headlights, signals, brake lights, emergency flashers and clearance lights.

PASS FAIL

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B. HORNS

1. Demonstrates horn works properly. (air & electric)

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C. SPLASH GUARDS

1. Demonstrates splash guards are present, firmly attached and are not damaged.

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D. FLUID LEVELS & LEAKS

1. Demonstrates method of checking fluid levels. This includes radiator, motor oil, transmission fluid (if accessible), and power steering fluid.
2. Checks for Fluid Leaks.

E. BELTS AND HOSES

1. Identifies and checks condition of belts and hoses.
This is to include but not limited to: (Circle item missed)

Belts

alternator
air compressor
fan / water pump
air conditioner

Hoses

power steering
water & radiator
smog pump
fuel

F. STEERING SYSTEM

1. Identifies and checks condition of steering gear box, pitman arm, steering knuckle arm, lower control arm and tie rod ends.

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G. TIRES, WHEELS, LUGS, RIMS

1. Checks tires for same height, width, type, excessive / unusual tread wear, bumps, cuts, duals not touching, objects between duals, etc.
2. Checks wheels / rims for cracks welds, bent rims or other damage.
3. Checks all lugs are present and tight, Looks for rust around lugs.
4. Checks hub odometer for damage.

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H. SPRINGS AND SHOCK ABSORBERS

1. Checks springs, for missing or broken leaves or poor alignment.
* Air ride bellows not leaking, properly inflated.
Height control arm nut bent, operating properly.
2. Check for loose or broken U-bolts, spring hangers or shackles.
3. Checks for loose, broken or leaking shocks.

PASS FAIL

I. BRAKES, DRUMS, LININGS

1. Checks condition of brakes including linings and drums for excessive or unusual wear or damage.
2. Checks push rods and slack adjusters for proper adjustment.

J. AXLE SEALS

1. Checks axle seals for exterior cracks or leakage around wheel hubs.

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K. DOORS AND MIRRORS

1. Checks that passenger & cargo doors operate OK, hinges are functional & doors are secure.
2. Checks mirrors for proper mounting, adjustment, damage, and visibility.
3. Grab handles secure, no loose or missing bolts.

L. EMERGENCY REFLECTORS

1. Identifies locations of reflectors. All are in fully serviceable condition. (three required)

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M. FUEL TANKS & BATTERY BOX

1. Checks that tanks are not damaged and are secure, cap gasket is in place, caps are tight and there is no leakage.
2. Checks crossover line for leaks.
3. Checks battery box mounting, & cover. Batteries secured against movement, cases not damaged or leaking. Fluid in batteries at proper level, cell caps secure.

N. AIR / ELECTRICAL LINES AND CONNECTORS

1. Checks air / electrical lines for damage and/or leaks.
2. Checks that connectors are in good condition and firmly attached.

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O. FIFTH WHEEL ASSEMBLY (TRACTOR & DOLLY)

PASS FAIL

1. Identifies the following parts:
 - a. King pin,
 - b. Locking pin,
 - c. Safety latch,
 - d. Release handle.
2. Checks that fifth wheel assembly does not have broken or damaged parts, that assembly is firmly attached to tractor or dolly, and that trailer is firmly attached to the fifth wheel.

P. LANDING GEAR / SLIDING TANDEM

1. Checks that landing gear is fully raised, has no missing or damaged parts and handle is secured.
2. Sliding tandem is locked & has no visible damage, worn or missing parts. Flexible air lines not cracked, crimped or otherwise damaged. Lines are secured against tangling, dragging, etc.

Q. BRAKE SYSTEM

1. Air compressor cuts in a 85 PSI. Minimum.
2. Air compressor cuts out at 125 PSI max.
(Acceptable cut out range 110 to 125 PSI)
3. **Static** pressure loss no greater than 3 PSI for a combination vehicle. (2 PSI single vehicle)
4. **Applied** pressure loss no greater than 4 PSI for a combination vehicle. (3 PSI single vehicle)
5. Low pressure warning device (light or alarm) activates at 50% maximum governed air pressure (on or before 60 PSI).
6. Emergency / parking system operates properly.
Emergency brake sets up between 20 and 45 PSI.
7. Pull test tractor park brake .
8. Rolling brake test complete system.

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R. GAUGES (OTHER THAN AIR)

Identifies and explains the following gauge / readings

1. Oil Pressure
- 2 Fuel
- 3 Temperature
- 4 Ammeter/Voltmeter
- 5 Speedometer
6. Tachometer
7. Brake application
8. _____

PASS FAIL

S. HEATER / DEFROSTER

1. Identifies and activates heater / defroster.

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T. WINDSHIELD, WIPERS AND WINDOWS

1. Windows free of any condition which obstructs view of driver or passenger.
2. Wipers function properly.

U. PANEL LIGHTS / INSPECTION STICKER

1. Identifies indicator lights on instrument panel.
2. Identifies and explains the purpose for inspection sticker.

V. STEERING WHEEL

1. Steering wheel play not in excess of 10 degrees.

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W. FIRE EXTINGUISHER

1. Secure in holder.
2. Inspection plate. Classification _____
- 3 Pressure gauge works. (charged)
- 4 Wire / plastic seal unbroken.
- 5 Pin secured. (if applicable)
- 6 Inspection tag dated within 12 months

TOTALS:

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FINAL SCORE:

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8.2 Basic Skills Evaluation

Purpose

The purpose of this unit is to evaluate drivers proficiency in basic vehicular skills during on range and/or low-density traffic conditions. The activities of this unit consist of driving range (yard) exercises that provide the opportunity to review and evaluate mastery of basic off street maneuvers.

Nearly all activity in this unit will take place on the range or under low-density traffic conditions. There is a brief classroom session to familiarize trainees with the exercises they will perform on the range and how their performance will be rated on the range and/or low-density traffic conditions.

Outline of Suggested Content

➤ Introduction to exercises (Classroom)

A. Description and purpose of range exercises.

1. Basic control skills.
2. Basic maneuvers.

B. Procedures and practice routines.

1. Basic control skills.
2. Basic maneuvers.

C. Standards for performance evaluation.

1. Basic control skills.
2. Basic maneuvers.

D. Safety rules for range exercises.

➤ Basic skills exercises (range)

A. Practice exercises,

1. Coupling & Uncoupling
2. Backing -- Straight line (single trailer unit).
 - a. Backing - Parallel park (single trailer unit).
 - b. Backing - Jackknife park (single trailer unit).
 - c. Coupling
 - d. Uncoupling

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3. Turnabout.
4. Forward stop.
5. Forward serpentine.
6. Offset alley.
7. Tight circles -- left and right.

➤ Skill attainment evaluation.

1. Performance testing for basic control skills.
2. Identification of remedial or additional practice needed to meet standards and/or unit objectives for each vehicle configuration.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Back tractor-semitrailer in straight line, curved paths, 45 degree angle, offset alley, and into a parallel park position.
- Use mirrors to check path and clearances while backing.
- Judge sides, rear, and overhead clearances and path of travel of the trailer.
- Maneuvering through sharp turns (e.g., offset or alley).
- Maneuvering through a series of sharp turns (e.g., forward serpentine).
- Maneuvering into areas restricted to the rear, sides, and front.

KNOWLEDGE OBJECTIVES

Driver must know:

- The procedures for backing and parking, lane positioning and merging.
- The correct position in which to place the vehicle before beginning backing or parking maneuver.
- The principles of reverse steering and articulated vehicles.
- The hazards of backing, the importance of avoiding unnecessary backing and the importance of checking the area prior to backing and of using a guide for assistance.

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SKILL OBJECTIVES

Driver must:

- 0 Demonstrate coordination of speed and directional control to achieve the desired path while backing or parking.
- 0 Demonstrate the ability to minimize trailer drift and oscillatory sway.
- 0 Coordinate steering input to prevent over or under steering.
- Adequately judge the path the trailers will take (off-tracking) as vehicle negotiates left or right curves and turns.

ATTITUDE OBJECTIVES

The driver must believe:

- That all backing is potentially dangerous, that the best way to avoid backing accidents is by avoiding the need to back.
- 0 That all backing accidents can be avoided.
- Proper lane positioning is absolutely essential to safe the operation of MTCVs.

Major supporting concepts

- Refer to instructional unit 2.6

MATERIALS

Instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and:

- Rules for range exercises
- 0 Rules for on-street driving
- 0 Range diagrams for exercises
- 0 Driver performance scoring criteria checklist or scoring forms

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8.3 Interacting With Traffic

Purpose

This unit provides instruction on the principles of visual search, communication and sharing the road with other traffic. Emphasis is placed on visual search, mirror usage, signaling and/or positioning the vehicle to communicate and understanding the special situations encountered by MTCVs in various traffic situations. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ **Introduction to sharing the road with other traffic.**

- A. As others see MTCVs.
- B. MTCV trailers can be intimidating to other road users.
- C. Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- D. MTCVs in the traffic stream can influence others sharing the road.
- E. MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.

➤ **Visual search techniques**

- A. Looking ahead
 - 1. Importance of looking far enough ahead.
 - 2. How far and how often to look ahead.
 - 3. What to look for in traffic and road conditions.
- B. Mirror usage
 - 1. Importance of clean and properly adjusted mirrors.
 - 2. Incorporating mirror adjustment in vehicle inspection procedures.
 - 3. Know the characteristics of various mirrors used.
 - a. Fields of vision.
 - b. Location and extent of blind spots.
 - c. How to read speed and distance of overtaking vehicles.
 - d. How to account for distortion of convex mirrors.
 - e. Amount of distortion and overlap between plane or flat and convex mirrors when used in combination.

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4. What to look for in your mirrors.
 - a. Traffic on either side and in back of the vehicle.
 - b. Check your vehicle and the tracking of the trailers behind the tractor.
5. Incorporate mirrors in visual search techniques.
 - a. Check mirrors quickly and frequently, looking back and forth between the mirrors and the road ahead.
 - b. Increase mirror usage during maneuvers such as lane changes, turns, merges and heavy traffic.
 - c. Be aware of blind spots and use your mirrors to compensate. Other traffic has to move into a blind spot. Proper visual search will reduce the probability of someone entering your blind spots unnoticed.
6. Vision problem areas around vehicle.
 - a. Area in front of hood.
 - b. Passenger side of truck - forward of fuel tank.
 - c. Driver side of truck - rearward of fuel tank.
 - d. Rear of truck or back of trailers.
 - e. During 90 degree right turn rearmost trailer will be lost in the mirrors.
7. Vision problems due to environmental conditions.
 - a. Bright sunlight or glare.
 - b. Rain, sleet, snow or dust storm.
 - c. Fog, low clouds in mountains or smoke from any source.
 - d. Darkness, dawn or dusk.

➤ Communications

- A. Signal to communicate what you intend to do in turns, lane changes, slowing down and preparing to stop.
- B. Use of brake light to communicate presence or intentions.
- C. Use of four-way flashers to communicate presence or intentions.
- D. Use of headlights to communicate presence or intentions.
- E. Use of horn to communicate presence or intentions.
- F. The way the vehicle is positioned can assist in communicating your intentions or confuse other traffic.
- G. Certain situations such as hazards, severe road conditions, weather conditions (rain, sleet, snow, fog, dust storm, low clouds in the mountains) or whenever it is difficult to see (night, dawn, dusk, or smoke) requires special effort to communicate presence and intentions.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Adjust road speed and space around vehicle to accommodate other traffic.
- Clean and properly adjust both flat and convex mirrors on the vehicle.
- Change or adjust mirror settings for trailers of different widths.
- Maintain a minimum 12 second visual search lead time.
- Scan both sides of the road using quick glances and describe roadside and or adjacent vehicle activity.
- Include appropriate instrument panel checks in the visual search pattern.
- Adjust visual search pattern during maneuvers such as lane changes, turns and merges.
- Measure speed and distance of overtaking vehicles.
- Monitor traffic entering and exiting the vehicle's blind spots.
- Monitor trailers and identify signs of vehicle problems.
- Adjust speed and space around vehicle for vision impairment due to environmental conditions.

KNOWLEDGE OBJECTIVES

Driver must know:

- How to compensate for the lack of understanding of others with whom we share the road.
- That other motorists are used to seeing only one trailer and that this perception could cause a hazardous situation.
- That the presence of **MTCVs** in the traffic stream influences the operation of other vehicles.
- The effects of having additional points of articulation.
- How to control rear trailer sway or amplification.
- The proper adjustments of the various types of mirrors.
- The difference in images presented by flat and convex mirrors.
- Appropriate visual search techniques for various road, traffic and maneuvering conditions.
- The relationship between speed and sight distance.
- The location and extent of blind spots on his / her vehicle.
- That truck blind spots are a safety concern that can only be reduced through incorporating appropriate mirror usage into visual search techniques.

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- When to actuate turn signals to provide adequate warning without creating confusion.
- State traffic laws for turn signals.
- The importance of signaling for the prevention of accidents.
- That not giving appropriate signals could lead to an accident.
- The conditions under which other drivers may give false signals.
- The appropriate use of the horn is to give warning to others of your presence only when needed.

ATTITUDE OBJECTIVES

The driver must believe that:

- 0 Obeying traffic laws is important and will reduce the risks of having an accident.
- 0 Courtesy on the highway is important and is a good safety principle to follow.
- 0 The perception of how others see professional drivers handling themselves and their vehicles is very important.
- 0 A professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.
- 0 Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- 0 It is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- 0 A professional driver is always in control of his / her vehicle and his / her emotions.
- 0 Emotional instability can contribute to unsafe acts.
- 0 MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.
- 0 The ability to respond to changing road conditions requires proper visual search techniques.
- 0 The first sign of trouble is often identified by the driver when checking his / her mirrors.
- 0 Development of good visual search habits is essential to safe driving and will reduce driver fatigue,
- 0 Signaling one's intentions is essential to avoiding accidents.
- 0 Improper use of the horn, signals, and the cb is potentially dangerous and will tarnish the image of the professional driver.

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Major supporting concepts

- Refer to instructional unit 3.1

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on how professional drivers interact with other traffic.

On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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8.4 Speed and Space Management

Purpose

This unit provides instruction on the principles of speed and space management. Emphasis is placed on maintaining safe vehicular speed and appropriate space surrounding the vehicle under various traffic and road conditions. Special attention is placed on understanding the special situations encountered by MTCVs in various traffic situations. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ **Speed management**

- A. The importance of Speed management.
- B. Speed and stopping distance.
 - 1. Perception distance.
 - 2. Reaction distance.
 - 3. Braking distance.
- C. Vehicle weight and stopping distance.
 - 1. Total vehicle weight and traction.
 - 2. Weight distribution in each trailer.
 - 3. One or more empty trailers.
- D. Vehicle configuration, speed and shape of the road.
 - 1. Wind resistance and cross winds.
 - 2. Effect of gap between trailers and wind resistance.
 - 3. Road curves, grades, crowns.
 - 4. Lane widths, narrow bridges, and soft shoulders.
- E. Matching speed to road surface conditions.
 - 1. Traction and road surface friction.
 - 2. Slippery and icy road conditions.
 - 3. Hydroplaning, black ice.
 - 4. Shaded areas and bridge freeze first.

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F. Speed and sight distance.

1. Sight distance and 12 to 15 second rule.
2. Effect of speed on field of vision.

G. MTCVs in the traffic flow.

1. How MTCVs influence the traffic flow.
2. Speed Management in traffic.
3. Speed Management in merging situations.

H. Speed limits and speed management.

1. Speed limit may be too fast.
2. Problems encountered when safe is slower than the speed limit.

I. Effect of speeding on equipment and driver.

1. Accelerated deterioration of equipment.
2. Increased breakdowns.
3. Increased cost of operation per mile.
4. Driver fatigue and decreased response to road, hazards and environment.

➤ Space management

A. The importance of Space management

B. Space cushion around vehicle.

C. Space to the sides.

1. Positioning vehicle properly on road surface.
2. Adjusting within lane for various road conditions.
3. Positioning vehicle properly for various maneuvers.
 - a. Curves.
 - b. Exit & entrance ramps.
 - c. Lane changes.
 - d. Turns.

D. Space ahead of vehicle.

1. Following distance rule.
2. Affect on space behind vs. ahead.
3. Legal requirements for following distance.

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- E. Space behind vehicle.
 - 1. Adjust fur blind spot.
 - 2. How to deal with tailgaters safely.
- F. Space above and below the vehicle.
 - 1. Overhead abutments, bridges, wires. etc.
 - 2. Road hazards and debris.
 - 3. Elevated railroad crossings and driveways.
- G. Traffic gaps and merging situations.
 - 1. Definition of gap in traffic.
 - 2. Space and speed requirements when:
 - a. Crossing and entering traffic.
 - b. Passing.
 - c. Merging.
 - d. Railroad crossings.
 - 3. Alignment with traffic when merging.
 - 4. Six point procedure fur merging into gaps.
 - a. Look fur gap.
 - b. Signal fur gap.
 - c. Aligning.
 - d. Find, locate or select gap.
 - e. Adjust speed.
 - f. Enter gap.
- H. Giving space to others.
 - 1. Principles of right of way.
 - 2. Avoid hindering traffic.
 - 3. Adjust following distance to produce gap fur others.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Judge the maximum safe speed at which a curve can be entered.
- 0 Judge the maximum safe speed that traction will permit.
- 0 Judge the maximum safe speed at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- 0 Adjust road speed of MTCVs to the configuration and condition of the roadway.
- 0 Adjust road speed of MTCVs to weather and visibility conditions.
- 0 Adjust road speed of MTCVs to vehicle, cargo and driver conditions.
- 0 Adjust road speed and space around vehicle to accommodate other traffic.
- 0 Obey the legal speed limit.
- 0 Select the lane of travel which offers best mobility and least traffic interruption, in accordance with the law.
- 0 Establish a safe gap before changing lanes, passing other vehicles, and crossing or entering traffic.
- 0 Position the vehicle correctly in the lane of travel thereby minimizing hazards to other road users.
- 0 Position the tractor and trailers appropriately while initiating and completing various maneuvers such as curves, exit and entrance ramps, lane changes, and turns.
- 0 Maintain a following distance appropriate to traffic flow, road surface, weather, visibility and vehicle weight configuration.
- 0 Must be able to avoid road hazards, debris and overhead structures with inadequate clearance.

KNOWLEDGE OBJECTIVES

Driver must know:

- The relationship of speed to stopping distance, hydroplaning, fuel economy and crash severity.
- What effects the points of articulation will have on speed management.
- What effects the points of articulation will have on the ability to maneuver.
- How to minimize rear trailer sway or amplification, sometimes referred to as crack-the-whip effect.

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- 0 The effect of vehicle weight distribution, center of gravity, vehicular stability, and road surface conditions on the maximum safe speed a set of MTCVs can travel.
- 0 The relationship between speed and sight distance.
- 0 The minimum safe following distance under various road, weather and traffic conditions.
- 0 That moving MTCVs encounter more air resistance than singles, especially with crosswinds. This is attributable to both the gaps between the trailers and to the increased overall length.
- 0 As vehicle speed increases, the angle decreases at which directional or lane changes can be made safely.
- 0 That speed adjustment is particularly critical on older roads built for smaller, slower vehicles.
- 0 State regulations concerning following distances, lane use, changing lanes, and passing other vehicles with MTCVs.
- 0 The appropriate following distance for various load configurations and road, weather and traffic conditions.
- 0 The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards.
- 0 The importance of proper positioning of the vehicle in its path of travel in response to road, weather and traffic conditions.
- 0 The importance of timing, acceleration and traffic gaps in order to manage space in traffic.
- 0 The dangers created by overhead obstructions.

SKILL OBJECTIVES

The driver must judge:

- The maximum safe speed at which a curve can be entered; that traction will permit; and, at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes.
- The minimum safe following distance under various road, weather and traffic conditions, using the following basic rule: Allow one second of space for each 10 feet of vehicle length at speed below 40 mph. At speed above 40 mph add one second for safety.

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ATTITUDE OBJECTIVES

The driver must believe:

- That driving skill and experience (proficiency) cannot compensate for speed that is excessive for prevailing conditions.
- There are situations where the speed limit may be too fast for road, weather and or traffic conditions.
- That obeying the speed limit is beneficial to the driver, his / her employer and will reduce the risks of having an accident.
- That courtesy on the highway is a good safety principle to follow.
- That the ability to respond to changing road conditions requires proper speed and space Management techniques
- That maintaining maximum separation from other vehicles increases sight distance and the opportunity to maneuver in response to hazards.
- That maintaining a minimum safe following distance under various road, weather and traffic conditions is important.
- That proper positioning of **MTCVs** is important to accident prevention.
- That it is the driver's responsibility to position the vehicle in such a way as not to impede other road users.
- That intimidating other road users by not maintaining minimum safe following distance under prevailing road, weather and traffic conditions is illegal, unsafe, and detrimental to public relations.
- When bobtailing, pulling an empty trailer(s) or pulling unstable or unevenly balanced loads, the basic formula for safe following distance needs to be increased.

Major supporting concepts

- Refer to instructional unit 3.2

MATERIALS

Classroom instruction must be supported by materials presenting information on speed and accidents, including visuals that illustrate the effects of various factors on speed and space management.

On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

8.5 Night Operations

Purpose

This unit provides instruction on the principles of Night Operations. Emphasis is placed on the factors affecting operation of MTCVs at night. Night driving presents specific factors that require special attention on the part of the driver. Changes in vehicle safety inspection, vision, communications, speed management and space management are needed to deal with the specific problems night driving presents. Most of the instruction is to take place in the vehicle.

Outline of Suggested Content

➤ **Night driving factors**

- A. Driver factors.
 - 1. Vision.
 - 2. Glare.
 - 3. Fatigue.
 - 4. Driver experience.
- B. Roadway factors.
 - 1. Level of illumination.
 - 2. Variations in level of illumination.
 - 3. Familiarity with roads.
 - 4. Other road users.
 - 5. Alcohol and drugs on the road.
- C. Vehicle factors
 - 1. Headlights.
 - 2. Marker lights.
 - 3. Auxiliary lights.
 - 4. Turn signals.
 - 5. Windshields.
 - 6. Mirrors.
 - 7. Length of vehicle.

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D. Conspicuity

1. Principle of conspicuity.
2. Levels of illumination & reflective markings.
3. Positioning of vehicle and visibility.
4. Turning maneuvers and visibility of vehicle.
5. Rear and side underride potential.

➤ Night driving procedures

A. Preparation to drive at night.

1. Getting yourself ready.
2. Plan your route.
3. Getting your vehicle ready.
4. Vehicle Safety Inspection at night.

B. Driving at Night

1. Avoid blinding others.
2. Avoiding glare.
3. Maximizing visibility.
4. Adjusting basic driving techniques.

C. Speed and sight distance at night.

1. Sight distance and 12 to 15 second rule.
2. Effect of sight distance on perception and total stopping distance.
3. Effect of illumination on field of vision.
4. Speed limit may be too fast.
5. Problems encountered when a safe speed is slower than the speed limit.

D. Space cushion around vehicle at night.

1. Space to the sides.
2. Space ahead of vehicle.
3. Affect on space behind vs. ahead.
4. Legal requirements for following distance.
5. Traffic gaps and merging situations.

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Judge the maximum safe speed at which vehicle control can be maintained under various levels of illumination.
- Adjust speed, following distance, and gap selection to nighttime conditions.
- Judge when to use high beams on headlights when legally permitted.
- Dim headlights, in accordance with state laws, to minimize interference with visibility of other drivers.
- Respond safely to the glare of other vehicles by averting eyes and not retaliating.

KNOWLEDGE OBJECTIVES

Driver must know:

- The effect of the level of illumination on ability to see (sight distance).
- The relationship between speed, illumination and sight distance.
- The appropriate following distance for various load configurations, road, weather and traffic conditions at night.
- The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards at night.
- The value of high beams to nighttime visibility.
- State laws governing use of headlights, high beams and auxiliary lights.
- The symptoms and dangers of fatigue.
- The effect of headlight glare on visibility of others and its implication for the safety of both road users.
- The general factors affecting night vision including interior illumination, ambient light and use of sunglasses during daytime.

SKILL OBJECTIVES

The driver must judge:

- Speed, distance, and separation between traffic under nighttime conditions.
- The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes at night.

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ATTITUDE OBJECTIVES

The driver must believe:

- The ability to see clearly diminishes at night.
- Driving skill and experience (proficiency) cannot compensate for speed that is excessive for levels of illumination and sight distance.
- There are situations where the speed limit may be too fast for levels of illuminations or sight distance.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards at night.
- That maintaining a minimum safe following distance under various levels of illumination is important.
- No one is immune to the effects of fatigue.
- That retaliating to other road users by using high beams is illegal, unsafe, and detrimental to public relations.

Major supporting concepts

- Refer to instructional unit 3.3

MATERIALS

Classroom instruction must be supported by materials presenting information on night driving procedures and the effects of various factors on sight distance and conspicuity. Include visuals demonstrating the effects of darkness and the consequences of improper night driving procedures.

On-range and on-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

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8.6 Extreme Driving Conditions

Purpose

This unit provides instruction on driving a particular MTCVs under Extreme Driving Conditions. Emphasis is placed on the factors affecting the operation of MTCVs in cold, hot and stormy weather and in the mountains and the desert. Changes in basic driving habits are needed to deal with the specific problems presented by these Extreme Driving Conditions.

Outline of Suggested Content

➤ Cold weather operation

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, fuel mixture, heater, defroster, windshield wipers, washer fluid, brakes, fifth wheel, etc.
2. Tires, mud flaps and tire chains, condition, types, installation etc.
3. Cold weather starting procedures,
4. Road and weather condition hazards while doing VSI.
5. Freeing a stuck vehicle or frozen brakes.

B. Driving in cold weather.

1. Vehicle speed, weight and stopping distance under various road conditions.
2. Total vehicle weight and traction under various road conditions.
3. Weight distribution in each trailer.
4. One or more empty trailers.
5. Wind resistance and crosswinds under various road conditions.
6. Effect of gap between trailers under various road conditions.
7. Road curves grades and crowns under various road conditions.
8. Shaded areas and bridges freeze first.

➤ Hot weather, desert conditions.

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner defroster, windshield wipers, windshield washer fluid, brakes, fifth wheel, etc.
2. Tires and brakes, condition, types, pressure etc.

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- B. Driving in desert conditions.
 - 1. Procedures and hazards.
 - 2. Effects upon vehicle operation.
 - 3. Effects upon driver alertness.
 - 4. Breakdown procedures,

➤ **Mountain driving.**

- A. Gravity.
 - 1. Total vehicle weight and speed control.
 - 2. Weight distribution in each trailer.
 - 3. One or more empty trailers.
- B. Mountain pre-inspection.
- C. Operating on upgrades.
- D. Operating on downgrades.
- E. Auxiliary braking devices (engine retarders).
- F. Truck escape ramps.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES: Adverse Weather

Driver must be able to:

- Prepare for operation in cold weather including use and installation of tire chains when necessary.
- Inspect vehicle and prepare for cold weather operation by paying special attention to coolant level and mixture of anti-freeze, fuel mixture, moisture in air tanks, heater, defroster, windshield wipers, washer fluid, brakes, fifth wheel, etc.
- Check for ice accumulation on brakes, slack adjusters, air hoses, electrical wiring, etc.
- Judge the maximum safe speed at which vehicle control can be maintained under various weather and road conditions.
- Adjust speed, following distance, and gap selection to weather and road conditions.

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KNOWLEDGE OBJECTIVES: Adverse Weather

Driver must know:

- 0 The conditions that produce low traction and the effects of rain snow and ice on the ability to maneuver and/or stop MTCVs.
- 0 The relationship between vehicle speed, weight and stopping distance under adverse weather conditions.
- 0 The causes and procedures for avoiding skidding, hydroplaning and jackknifing MTCVs.
- 0 The appropriate following distance for various MTCV load configurations, road, weather and traffic conditions under adverse weather conditions*
- 0 The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards encountered under adverse weather conditions.
- 0 How and where to mount and dismount tire chains on MTCVs.

SKILL OBJECTIVES: Adverse Weather

The driver must:

- Adjust rate of change in speed (acceleration and deceleration) and direction of travel to road and weather conditions to maintain control of vehicle.
- Judge appropriate speed, distance, and separation between traffic under adverse weather conditions.

ATTITUDE OBJECTIVES: Adverse Weather

The driver must believe:

- That adverse weather conditions require special driving techniques and increased vigilance on the part of MTCVs drivers.
- Driving skill and experience (proficiency) cannot compensate for speed and directional changes that are excessive for weather and road conditions.
- There are situations where the speed limit may be too fast for road, weather and traffic conditions.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards .
- That it is especially important for drivers of MTCVs to keep themselves informed of latest weather and road conditions,

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PERFORMANCE OBJECTIVES: Hot Weather, Desert Conditions

Driver must be able to:

- 0 Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner, defroster, windshield wipers, windshield washer fluid, tires, brakes, fifth wheel, etc.
- 0 Adjust driving habits to accommodate effects of desert heat.

KNOWLEDGE OBJECTIVES: Hot Weather, Desert Conditions

Driver must know:

- 0 Procedures and hazards for hot weather, desert driving.
- 0 The effects of hot weather driving on engine operating range, cooling system, fuel system, tires / tire pressure and the driver himself/herself.

SKILL OBJECTIVES: Hot Weather, Desert Conditions

The driver must:

- Judge road direction and distance in the desert.

ATTITUDE OBJECTIVES: Hot Weather, Desert Conditions

The driver must believe:

- That hot weather can affect vehicle operation.
- 0 That special precautions are required in inspecting **MTCVs** and preparing for hot weather / desert operation.
- 0 That it is dangerous to leave a vehicle when it is disabled in the desert.

PERFORMANCE OBJECTIVES: Mountain Driving

Driver must be able to:

- 0 Do a mountain pre-inspection and adjust brakes if necessary.
- 0 Place transmission in appropriate gear while ascending and prior to descending grade.
- 0 Use proper braking techniques while descending grade.

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KNOWLEDGE OBJECTIVES: Mountain Driving

Driver must know:

- The effect of vehicle weight distribution and speed on downhill braking techniques.
- The function and value of escape ramps.

SKILL OBJECTIVES: Mountain Driving

The driver must:

- Utilize appropriate gear for descending grade.
- Operate braking system for maximum efficiency and safety.

ATTITUDE OBJECTIVES: Mountain Driving

The driver must believe:

- The proper gear and appropriate downhill braking technique is important to safely descend a mountain.
- That use of a truck escape ramp is safer than attempting to negotiate a downgrade when the vehicle is out of control.

Major supporting concepts

- Refer to instructional unit 3.4

MATERIALS

Classroom instruction must be supported by materials presenting information on extreme driving conditions and procedures for operating in extreme conditions.

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8.7 Hazard Perception

Purpose

This unit provides instruction on the principles of recognizing hazards in sufficient time to reduce the severity of the hazard and neutralize a possible emergency situation. While hazards are present in all motor vehicle traffic operations, some are peculiar to MTCV combinations. Emphasis is placed on hazard recognition, visual search, and response to possible emergency producing situations encountered by MTCVs in various traffic situations. Most of the instruction is to take place in the vehicle using commentary driving techniques.

Outline of Suggested Content

➤ Importance of hazard recognition

- A. Definition of a hazard.
- B. Role of visual search in hazard perception.
- C. Methods used in hazard perception.
- D. Sources of clues / where to look.

➤ Road characteristics

- A. Nature of problems encountered.
- B. Surface conditions due to weather, debris or construction.
- C. Shape and contour of the road.
 - 1. Tight curves with insufficient superelevation.
 - 2. Hazardous sequence of curves.
 - 3. Short deceleration lanes.
 - 4. Curb placement on curves.
 - 5. Ramp downgrades leading to tight curves.
 - 6. Off-tracking of MTCVs.
 - 7. Speed advisory signs for curves / ramps appropriate for cars not trucks.
- D. Visibility restrictions.
 - 1. Rain, sleet, snow, low clouds in mountains, fog and smoke.
 - 2. Dawn, dusk and night.
 - 3. Objects in line of sight.

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E. Crosswinds.

1. Signage.
2. Identification of probable locations.
3. Change in direction of travel.

➤ Road user characteristics

- A. Drivers with obstructed vision .
- B. Distracted or confused drivers.
- C. Slow moving vehicles.
- D. Impatient or impaired drivers.

➤ Road user activities

- A. Driver or vehicle movement.
- B. Emergency areas and pedestrians/cyclists.
- C. Conflicts.

➤ Characteristics of MTCVs.

- A. Definition of sensory feedback,
- B. MTCVs have additional points of articulation and therefore require additional vigilance and skills.
- C. Effect of additional coupling points on sensory feedback.
- D. Effect of gap between trailers under various road and traffic conditions.
- E. Effect of weight distribution in each trailer.
- F. Effect of isolation from trailing units with single pintle hook couplings.
- G. Reduced ability to sense impending trailer instability i.e. sliding, rollover, or bounce.
- H. Wind resistance and crosswinds under various road configurations.
- I. Development of special kinesthetic, body "feel" or sense for the trailing unit and the dynamic forces acting on it.
- J. Role mirrors play in identifying hazardous situations.

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➤ Commentary driving techniques

- A. Definition and role in safety education.
- B. Hazard identification.
- C. Hazard description.
- D. Search, Identify, Predict, Decide, Execute (SIPDE) concepts.
- E. Examples of commentary driving techniques.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Identify (using Commentary Driving techniques) road conditions and road users that pose a potential threat to the safety of the MTCV driver.
- Adjust road speed and space around vehicle to reduce the potential threat posed by either road conditions or other road users.
- 0 Adjust visual search pattern to compensate for the potential threat posed by either road conditions or other road users.
- 0 Monitor trailers and identify signs of impending hazardous situations.
- Develop a special kinesthetic sense or body “feel” for the trailing unit, through experience, vigilance and appropriate mirror usage.

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 The visible characteristics of road conditions that present a hazard to safe operation. This is to include slippery, soft, sloping, or uneven surfaces, debris, dangerous curves, obstruction to visibility, and locations where there are likely to be strong crosswinds, low clouds and fog.
- 0 The characteristics of other road users (drivers or pedestrians) that make them potentially dangerous. This is to include obstructed vision, distraction, confusion, impatience, impairment, and low speeds.
- 0 What activities of other road users are capable of providing clues to potential danger. This is to include head and body movement, vehicle movement, and emergency or conflicting situations.
- 0 How to compensate for the lack of understanding of others with whom we share the road.
- 0 That the presence of MTCV trailers in the traffic stream influences the operation of other vehicles.

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- How to develop a sense for the changing dynamic forces acting on the trailers.
- The effect of delayed trailer response to driver steering.
- How to compensate for the increased number of coupling points and resulting impaired sensory feedback when driving MTCV trailers.

SKILL OBJECTIVES

The driver must:

- Perceive immediately a potential threat by the visible characteristics and actions of other road users and initiate prompt defensive or evasive action.
- Perceive immediately a potential threat by the visible characteristics of road conditions and initiate prompt defensive or evasive action.
- Focus on developing a special kinesthetic or body "feel" or sense for the MTCVs trailing unit,

ATTITUDE OBJECTIVES

The driver must believe:

- That MTCV combinations have additional points of articulation and therefore require additional vigilance and skills.
- That the ability to respond to changing road conditions requires constant vigilance and attention.
- That most hazards can be detected in time to avoid a collision.
- That serious hazards are encountered frequently enough to require constant attention to changes in the environment.
- That any delay in responding to a perceived hazard can result in an accident.
- That a professional driver has a moral obligation to himself/herself and the motoring public to do the best he/she can do.
- Professional drivers must compensate for the lack of understanding of others with whom we share the road.

Major supporting concepts

- Refer to instructional unit 4.1

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by MTCV drivers and materials that review commentary driving techniques. On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist.

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8.8 Hazardous Situations

Purpose

This unit provides classroom discussion on dealing with specific procedures, appropriate to MTCV emergencies. These include evasive steering, emergency braking, off-road recovery, brake failures, tire blowouts, rearward amplification, hydroplaning, skidding, jackknifing and the rollover phenomenon. The discussion will include a review of unsafe acts and the role they play in producing hazardous situations.

Outline of Suggested Content

➤ **Hazardous situations**

- A. Definition.
- B. Nature of problems encountered.
- C. Role of safe operating practices.
- D. Review of unsafe acts.
- E. Reducing the severity of the hazardous situation.

➤ **Emergency maneuvers**

- A. Role of emergency maneuvers.
 - 1. Evasive steering.
 - 2. Emergency stop.
 - 3. Off-road recovery.
 - 4. Brake failure.
 - 5. Blowouts.

➤ **Skid dynamics**

- A. Definition of friction and traction.
- B. Stage of traction.
 - 1. Static traction.
 - 2. Rolling traction.
 - 3. Sliding traction.
- C. Wheel load.

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- D. Forces of motion.
- E. Four basic causes of skids.
 - 1. Braking.
 - 2. Accelerating.
 - 3. Change in direction.
 - 4. Hydroplaning.
- F. Preventing skids.

➤ **Types of skids MTCVs can experience**

- A. Steering wheel skid.
- B. Tractor drive axle (rear wheel skid).
- C. Trailer skid.
 - 1. Single.
 - 2. Multiple.
- D. All wheel skid.
- E. Power skids.
- F. Spin-out.
- G. Hydroplaning.
- H. Summary of skid prevention.

➤ **Skid recovery**

- A. Speed control.
- B. Steering characteristics.
 - 1. Oversteering.
 - 2. Understeering.
 - 3. Neutral steering.
- C. Corrective steering.
- D. Countersteering.
- E. Braking to stop.

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➤ Rollover

- A. Definition.
- B. Rearward amplification.
- C. Trailer sway.
- D. Rollover threshold.
 - 1. Speed and direction.
 - 2. Condition of roads, curves, ramps and superelevations.
 - 3. Weight of cargo and height of vehicle's center of gravity.
 - 4. Bulk liquids and surge.
 - 5. Motion and visual cues.
 - 6. Prevention using safe driving practices.

➤ Unsafe driving acts

- A. Definition.
- B. Behavioral factors most frequently reported.
- C. Prevention using safe driving practices.

➤ Recommended responses to unavoidable emergencies

- A. All responses have to be measured and less severe than in a tractor trailer
- B. Go easy on foot controls, use "egg shell" pressure.
- C. Use service brake only.
- D. Reduce the severity of your actions.
- E. Decide to take choice of lesser consequence when necessary

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Identify road conditions and road users that are a potential threat to the safety of himself/herself and other road users.

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KNOWLEDGE OBJECTIVES

Driver must know how to:

- 0 Incorporate safe operating practices into daily driving habits,
- 0 Bring the MTCV to a stop in the shortest possible distance while maintaining directional control of the MTCV on dry pavement.
- 0 Bring the MTCV to a stop in the shortest possible distance while maintaining directional control of the MTCV on **slippery** pavement.
- 0 Perform a "quick" evasive turn on a dry surface.
- 0 Make an evasive turn off the roadway and return to the roadway while maintaining directional control of the vehicle.
- 0 Maintain directional control while operating over a slippery surface.
- 0 Recover from skids induced by slippery surfaces.
- 0 Correct for vehicle's steering characteristics.

Driver must know:

- The principle unsafe driving acts or behaviors that contribute to or cause the majority of motor vehicle crashes.
- The role safe operating practices play in reducing the severity of hazardous situations.
- That the vehicle can generally be turned more quickly than it can be stopped.
- That in an impending head-on collision, it is generally safer to leave the roadway than to strike another vehicle.
- The procedures for quick stops, quick turns, and evasive turns off the roadway.
- The procedures for handling brake failures and tire blowouts.
- The procedures for reducing the effects of rearward amplification of the rear trailer.
- The procedures for minimizing the possibility of rollover.
- The causes of skids.
- The best prevention for skidding is to control speed and adjust driving habits to weather, road, and traffic conditions.
- The principles of skid dynamics, friction, wheel load, fidelity (tracking), force and rearward amplification.
- The characteristics of a tractor or trailer (s) jackknife, steer axle skid, all wheel skid, hydroplaning and rollover.
- Skid control and recovery procedures.

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SKILL OBJECTIVES

THE DRIVER MUST:

- Recognize a potential threat by the visible characteristics and or actions of the threat and initiate prompt defensive actions.

ATTITUDE OBJECTIVES

The driver must believe:

- That unsafe driving acts or behaviors cause or contribute to motor vehicle crashes.
- That it is safer to leave the road than to risk a head-on collision with another road user.
- A driver should never give up efforts to cope with an emergency.
- That most skids are preventable.
- That skids can occur at any speed.
- That it is possible to recover from skids if they are detected and corrected promptly.

Maior supporting concepts

- Refer to instructional unit 4.2

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazardous situations most commonly encountered by MTCV drivers. Printed or visual materials that describe unsafe driving acts (UDA) and the frequency with which they are encountered should be used for discussion purposes. Materials presenting information on physical principles of friction, traction, wheel load, forces of motion, skid control and recovery procedures and rollovers should also be used.

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8.9 Public Relations And Safety

Purpose

This unit provides classroom instruction on the importance of professionalism , maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

Outline of Suggested Content

➤ The image of the trucking industry

- A. From the government sector,
- B. From the public's perspective.
- C. from the trucking company perspective.
- D. from the driver's perspective.

➤ Contact with the public

- A. Safe driving principles and good image.
 - 1. Following the law.
 - 2. Following Safe Operating Practices
 - 3. Sharing the road.
 - 4. Being courteous and helpful.
- B. Good appearance and attitude,
 - 1. Both on & off duty.
 - 2. Show respect, courtesy and understanding.
 - 3. Rendering assistance,
 - 4. Standing up for the industry with dignity and understanding'
 - 5. Be proud to be a professional driver.

➤ Customer relations

- A. A driver is his / her company's visible contact with the customer.
- B. Drivers can sell themselves and their company.
- C. Follow the rules, both your company's and the customer's.
- D. Have a positive attitude, it will get you where you want to go

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➤ **Employer relations**

- A. Know your basic job requirements.
- B. Comply with the Federal Motor Carrier Safety Regulations requirements.
- C. Follow company policies and procedures.
- D. Always display a professional attitude.

➤ **Safety concerns**

- A. Special hazards to MTCVs on the road.
 - 1. Steep grades.
 - 2. Sharp curves.
 - 3. Narrow lanes & shoulders, etc.
- B. Handling characteristics.
 - 1. Rearward amplification.
 - 2. High speed off-tracking.
 - 3. Impaired sensory feedback to the driver
- C. How to compensate.
 - 1. Increase knowledge through training.
 - 2. Increase driving skill through training.
 - 3. Incorporate Safe Operating Practices into driving habits.
 - 4. Always display a professional attitude while driving.

➤ **Future of MTCVs in trucking**

- A. Population growth rate.
- B. Increased density of people and traffic.
- C. Shortage of well trained, experienced drivers.
- D. A Career for a Professional!

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INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Maintain a neat personal appearance on and off duty.
- Interact tactfully with customers and the general public.
- Lend assistance to other motorists when permitted.
- Be courteous to other drivers by following the principles of sharing the road.
- Incorporate Safe Operating Practice driving principles into driving habits.
- Always display a professional attitude, even in the face of adversity.
- Compensate for the special handling characteristics and unique road hazards peculiar to MTCVs.

KNOWLEDGE OBJECTIVES

Driver must know:

- The impact the driver has on the image of his / her company and the trucking industry.
- How to show respect, courtesy and understanding.
- The direct and indirect effects of unsafe and discourteous acts upon the public's image of his / her employer and the trucking industry.
- The rules of the company and the customer.
- The proper procedures for handling complaints from the general public or customers.
- The particular handling characteristics of MTCVs and know how to compensate for them.

ATTITUDE OBJECTIVES

The driver must believe:

- That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- That obeying traffic laws will not only reduce the risks of having an accident but will enhance the image of the professional driver.
- That company and customer rules and regulations are important and should be followed.
- That courtesy on the highway is important, improves the image of the company and the industry and is a good safety principle to follow.

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- 0 Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- 0 That it is his / her responsibility to enhance the image of the professional driver on the road and elsewhere.
- 0 That a professional driver is always in control of his / her vehicle and emotions.
- 0 Improper use of the horn, signals, and the cb is potentially dangerous and will tarnish the image of the professional driver.
- 0 That a professional driver has a moral obligation to himself/herself and the motoring public to be the best he/she can be.

Major supporting concepts

- 0 Refer to instructional unit 5.3

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on driver professionalism, the image of the trucking industry, public and employer relations, interpersonal skills, safety concerns and how to compensate.

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8.10 Proficiency Evaluation

Purpose

The purpose of this unit is to evaluate drivers proficiency in vehicular skills during on range exercises and under varying road and traffic conditions. The activities of this unit consist of driving range (yard) exercises and over the road driving. This will provide the opportunity to review and evaluate mastery of both off road and on street driving skills.

Nearly all activity in this unit will take place on the range (yard) and on public roadways in a full range of traffic environments applicable to this vehicle configuration. This is to include urban and rural uncontrolled roadways, expressways or freeways, under light, moderate and heavy traffic conditions. The driver will also be assessed for regulatory compliance with all traffic laws.

There is a brief classroom session to familiarize drivers with the type of range (yard) and un-street maneuvers they will perform and how their performance will be rated.

Outline of Suggested Content

➤ Introduction to proficiency evaluation (Classroom)

A. On range evaluation

1. Description and purpose.
2. Standards for performance evaluation.
3. Performance checks (criteria) for on-range evaluation,
4. Safety rules for range evaluation.

B. On-street evaluation.

1. Description and purpose
2. Types of maneuvers.
3. Route plan.
4. Standards fur performance evaluation.
5. Performance checks (criteria) for un-street evaluation.
6. Safety rules for un-street evaluation.

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➤ Proficiency evaluation: On-range

A. Tasks / Maneuvers.

1. Vehicle Safety Inspection.
2. Couple single trailer.
3. Backing -- Straight line (single trailer unit).
 - a. Backing - Parallel park (single trailer unit).
 - b. Backing - Jackknife park (single trailer unit).

B. Couple remainder of MTCV

1. Turnabout.
2. Forward stop.
3. Forward serpentine.
4. Offset alley.
5. Tight circles -- left and right.

C. Uncouple MTCV (after On street evaluation)

➤ Proficiency evaluation: On-street

1. Situations:
 - a. Various roadways.
 - b. Controlled and uncontrolled interchanges.
 - c. Freeway interchanges.
 - d. Hills and grades.
 - e. Vehicle merges.
 - f. Traffic restriction areas.
 - g. Traffic control areas (stop sign or light controlled intersections).
 - h. Blind intersection.
 - i. Parking.

➤ Skill attainment evaluation.

1. Proficiency evaluation results.:
2. Identification of remedial or additional practice needed to meet standards for each vehicle configuration.

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➤ Skill attainment evaluation

- 0 Trainee performance is evaluated against a prescribed criteria, including these basic control factors:
1. **Acceleration:** Smooth acceleration; no jerky, abrupt acceleration from a standing start and when increasing speed.
2. **Braking:** Smooth, controlled stops, no rebound of front end or sound of exhausting air.
3. **Stopping point:** Comes to a complete stop within 3 feet of stopping point or within sufficient distance from the vehicle ahead.
4. **Upshifting:** Shifts through all gears without hesitation. Does not miss or skip a gear causing lurching / lugging (failure to shift soon enough). Shifts smoothly at proper RPM without jerking the vehicle. Double clutches all shifts with a minimum of grinding.
5. **Downshifting:** The gear selected is suitable to the road speed of the vehicle driven, Shifts smoothly without hesitation and minimal grinding of the gears. Double clutches all shifts.
6. **Uphill Operation:** The gear selected is suitable to the road speed and gradeability of the engine, Driver shifts smoothly without hesitation and minimal grinding. Double clutches all shifts.
7. **Starting On An Incline:** Driver pulls away from the stop smoothly. Engine remains running. Vehicle does not roll back. Driver properly coordinates the parking brake; foot brake, and throttle resulting in the vehicle pulling away smoothly.
8. **Downhill Operation:** Driver starts down the hill in the proper gear and uses the appropriate braking technique for the decline. Speed does not exceed the posted speed limit.
9. **Speed Adjustment - Curves:** Driver adjust speed prior to entering curve and maintains appropriate speed throughout curve. Driver does not shift or brake in the curve.
10. **Lane-Keeping - Straight:** Driver maintains lane position in path of travel without touching or crossing lane markings.
11. **Lane-Keeping - Curve:** Driver maintains lane position in path of travel without wandering back and forth between lines or touching or crossing lane markings.
12. **Lane-Keeping - Turn:** Driver operates vehicle within the designated lane without crossing lane demarcation lines or running off pavement edge, unless vehicle length and street width necessitates encroachment.

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- a. **Right Turn:** Driver negotiates right turn without trailer tires crossing lane demarcation line, touching curb or running off pavement edge, unless vehicle length and street width requires it.
 - b. **Left Turn:** Driver negotiates left hand turn without cutting across the top of the turn (crossing the center line of the street he/she is entering), unless vehicle length and street width requires it.
13. **Curves:** Driver holds lane position without drifting or weaving. Trailer wheels are kept within lane markings and driver steers appropriately to the far left or right to compensate for the off-tracking of the trailers.
14. **Signaling:** Driver activates appropriate signal before performing maneuver. Driver cancels signal before upshifting or within 5 seconds of accomplishing maneuver.
15. **Mirror Checks:** Driver makes regular checks (approximately every ten seconds) of his / her mirrors to be aware of traffic and to check condition of vehicle.
16. **Mirror Checks - Turns:** Driver checks position of trailer with appropriate mirror or by looking over his / her shoulder when the rear of the trailer reaches the top of the turn.
17. **Mirror Checks - Lane Change:** Driver checks appropriate mirror before initiating lane change. Driver maintains lane position while checking appropriate mirror.
18. **Mirror Checks - merge:** Driver checks appropriate mirror before initiating lane change.
19. **Lane changing:** Driver pauses briefly (subsequent to signaling and checking mirror) before crossing lane delineator. Lane change is gradual and not abrupt. Driver maintains control of the vehicle and does not allow vehicle to wander.
20. **Merging:** Driver activates the turn signal in the direction of the intended merge before initiating merge; the vehicle is properly aligned to the roadway before a mirror check is made; driver makes a mirror check before initiating the merge.
21. **Traffic restrictions:** Driver obeys all traffic restrictions. i.e. using correct lane, obeys traffic control devices, maintains a safe speed below the posted speed limit, yields the right of way, drives within solid delineator or zebra stripe, etc.
22. **Uncontrolled intersection:** Driver looks both ways prior to entering the intersection; chooses appropriate rate of speed / gear for conditions.
23. **Railroad crossing:** Driver looks both ways prior to traveling over a railroad crossing; chooses an appropriate rate of speed / gear for conditions and doesn't shift gears while traveling through the railroad crossing.

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- 24. **Blind intersection:** Driver reduces speed and looks towards the blind intersection prior to entering it.
- 25. **Parking:** Driver considers or plans for the vehicles exit prior to positioning the vehicle. Driver is legally and appropriately parked while not blocking other traffic. Driver sets the parking brake and puts the vehicle in the proper gear and or blocks the wheels.
- 26. **Right of way:** Driver proceeds on a technical right of way only when safe and appropriate. When appropriate driver yields the right of way. Driver exercises due caution for other vehicles and fur pedestrians regardless of who has right of way.
- 27. **Following distance:** Drive constantly maintains adequate following distance, never crowding other vehicles.
- 28. **Vision management:** Driver scans for hazards as evidenced by eye and or head movement. Driver exhibits good vision management by identifying what he/she sees through the use of commentary driving techniques.

INSTRUCTIONAL OBJECTIVES

This unit introduces no new instructional objectives.

MATERIALS

- A. Rules for range evaluation
- B. Rules for on-street evaluation
- C. Driver performance scoring criteria checklist or scoring forms

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ABBREVIATIONS

ASF	Automotive Safety Foundation
ATA	American Trucking Association
ATA-MC	American Trucking Association Maintenance Council
CCJ	Commercial Carrier Journal
CDL	Commercial Driver License
CFI	Consolidated Freightways, Inc.
FHWA	Federal Highway Administration
FR	Federal Register
MVMA	Motor Vehicle Manufacturers Association
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
OMC	Office of Motor Carriers (FHWA)
OTA	Office of Technology Assessment (U.S. Congress)
PTDIA	Professional Truck Driver Institute of America
TRB	Transportation Safety Board
TRI	Trucking Research Institute of ATA Foundation
UMTRI	University of Michigan Transportation Research Institute
UPS	United Parcel Service
USDOT	United States Department of Transportation
WHI	Western Highway Institute
FS	Yellow Freight System, Inc.

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